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JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

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The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

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Vol. 38. January, 1936. No. 445.

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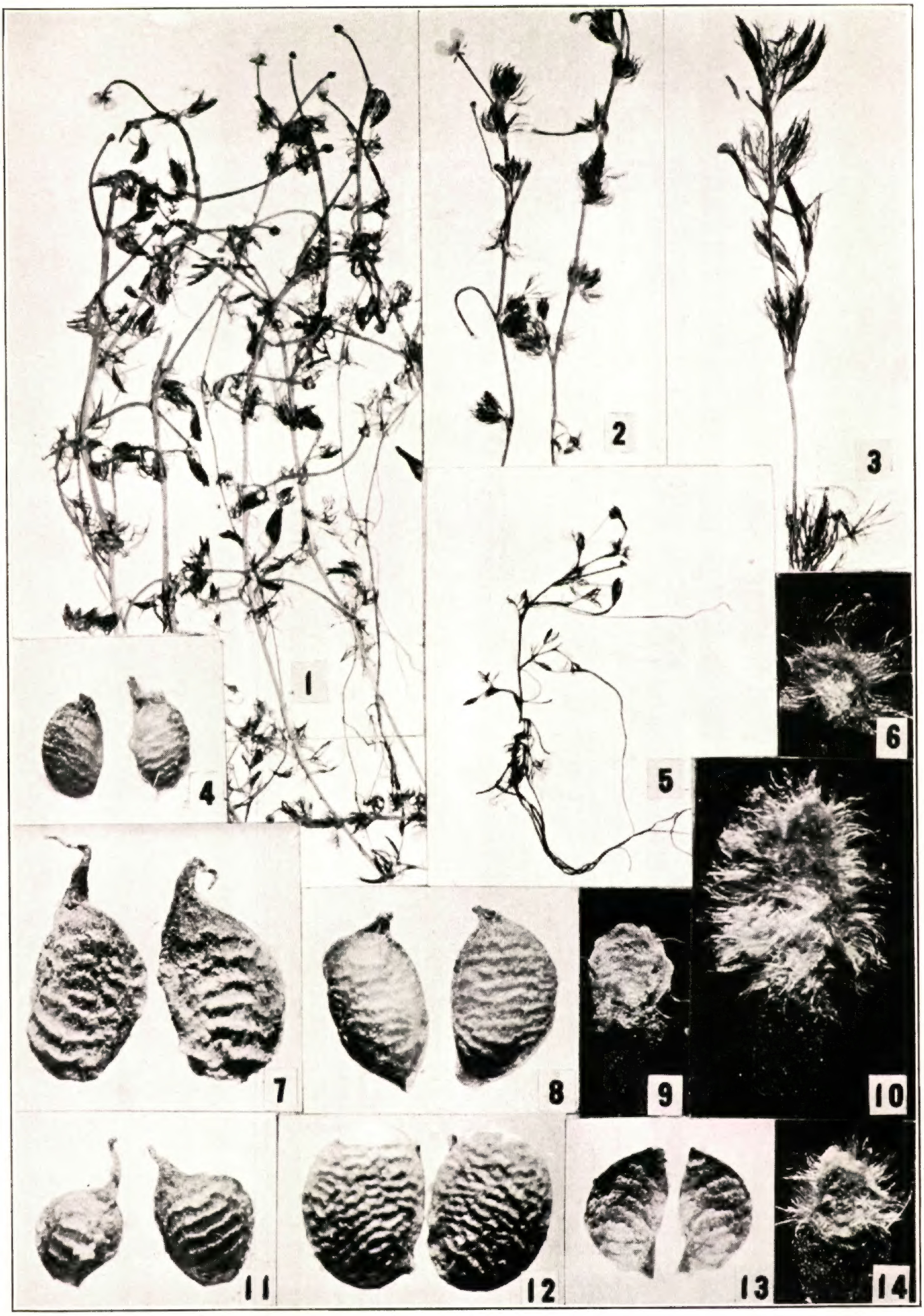

RANUNCULUS § BATRACHIUM: habit, × 1; achenes, × 10; receptacles, × 10. R. SUBRIGIDUS: FIG. 1, flowering stems; FIG. 4, achenes: FIG. 10, receptacle. R. LONGIROSTRIS: FIG. 2, flowering stems; FIG. 11, achenes; FIG. 14, receptacle. R. PUEBLENSIS: FIG. 3, stem; FIG. 7, achenes. R. LOBBII: FIG. 12, achenes. R. TRICHOPHYLLUS, var. TYPICUS: FIG. 6, receptacle; FIG. 13, achenes. Var. ERADICATUS: FIG. 5, plant. Var. CALVESCENS: FIG. 8, achenes; FIG. 9, receptacle.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CX.

THE NORTH AMERICAN REPRESENTATIVES OF RANUNCULUS, § BATRACHIUM

W. B. Drew

(Plate 406)

The need for a revision of the North American species of the section *Batrachium* of the genus *Ranunculus* was brought to my attention by Professor M. L. Fernald. The North American Batrachian *Ranunculi* have never been intensively studied; but the European representatives of the group have received a great deal of critical attention. It is the purpose of this paper to attempt to make clear the taxonomic and phytogeographic affinities of the North American members of the section.

The first really critical study of the North American representatives of the group was that of Hiern,[1] an English botanist, who, in 1871 treated them in his worldwide survey of the group. Hiern's study is noteworthy because of his conservatism in regarding all the Batrachian *Ranunculi* as forms of a single species, *Ranunculus hydrocharis* Spenn. It is also of interest to note that in this paper Hiern described for the first time the endemic North American *Batrachium*, now known as *Ranunculus Lobbii* (Hiern) Gray. Following Hiern, Lawson,[2] a Canadian, next treated the North American *Ranunculi* in a study of importance. Lawson, though breaking away from Hiern's inclu-

[1] Hiern, W. P., On the Forms and Distribution over the World of the *Batrachium* Section of *Ranunculus*. Journ. Bot. ix 43–49; 65–69; 97–107 (1871).

[2] Lawson, G., Revision of the Canadian *Ranunculaceae*. Trans. Roy. Soc. Canada ii. sect. iv 44–46 (1884).

sive *Ranunculus hydrocharis*, treated *R. Lobbii* (as had Torrey and Brewer & Watson before him) as a variety of *R. hederaceus* L.; but, these two species are so well marked, as I shall later show in the synoptical section of this paper, that such a course does not now seem justified. Lawson also regarded the strictly American *R. longirostris* Godr., the arctic and subarctic *R. confervoides* Fries, and the Old World *R. Drouetii* F. Schultz as all American and as varieties of *R. aquatilis* L.

In 1886, Gray[1] revised the North American *Ranunculi;* but his study of the section *Batrachium*, though better in respect to the separation of specific entities than Lawson's treatment, reflected the then prevalent opinion that the North American representatives of *Batrachium* were identical, for the most part, with their European relatives. However, as I show in the paragraphs dealing with the geographical distribution in North America of the section *Batrachium*, the majority of our Batrachian *Ranunculi* are endemic to North America. The only other critical treatment of the North American representatives of *Batrachium* is that of Davis,[2] who made a taxonomical study of the North American *Ranunculaceae* in 1900. In his study, Davis, largely following the earlier (1897) arrangement of Britton and Brown,[3] added little to a clearer understanding of *Batrachium* in North America.

DIAGNOSTIC CHARACTERS

GYNOECIUM. In distinguishing between the species of the *Batrachium* section of *Ranunculus*, the mature fruits offer perhaps the most valuable diagnostic characters. The shape of the achenes does not seem to be reliable, except between species which are otherwise not closely related. Length of achenes, providing many measurements of the fruit of a given species are made, is of diagnostic value. Thus, for example, the achenes of *Ranunculus longirostris* range from 1–1.6 mm. in length, whereas those of the closely related *R. subrigidus* are from 1–1.5 mm. long; but the average length of the achene in *R. longirostris* is 1.5 mm., in *R. subrigidus* 1.25 mm. Moreover, *R. Lobbii* may be set off from most of the other Batrachian *Ranunculi* because of its relatively large (2.25 mm. long) achenes. The number

[1] Gray, A., *Revision of the North American Ranunculi*. Proc. Am. Acad. Arts & Sci. xxi. 363–378. (1886).

[2] Davis, K. C., *Native and Cultivated Ranunculi of North America and Segregated Genera*. Minn. Bot. Studies ii. 460–462. (1900).

[3] Ill. Fl. No. U. S. and Can. ii. 83–84. (1897).

of achenes per flower is also significant, although in certain instances, as in *Ranunculus trichophyllus* and its varieties, the value of this character is somewhat lessened by the frequent failure of carpels to reach maturity. In general, however, number of achenes is useful if treated with due regard to the variation in each species. The length and position of the persistent style-base, or beak, are important. The achenes of *Ranunculus longirostris,* for example, may be distinguished from those of all other Batrachian *Ranunculi* by their long beaks (± 1 mm.). The lateral position of the persistent style-base of the achene is significant in *R. Lobbii,* since in the other North American species it is usually subterminal or rarely sublateral.

The pubescence of the fruit, which has been widely employed in distinguishing between species of *Batrachium,* is composed of stout trichomes which are usually localized on the upper or convex side of the achenes. Often, however, the presence of these hairs is affected by the abrading action of running water. Nevertheless, at least one *Batrachium* in North America, *Ranunculus trichophyllus,* var. *calvescens,* appears to have carpels with deciduous trichomes, for the latter, though sparingly present on the immature fruit, are consistently absent at maturity. Among the other Batrachian *Ranunculi,* only *R. hederaceus* and *R. Lobbii* have the achenes glabrous from the first.

The receptacle of the fruit is of some diagnostic value. Thus, in *Ranunculus subrigidus,* the length of the receptacle is usually between 1.75 and 2 mm., whereas in the closely related *R. longirostris,* the receptacle is about 1.25 mm. long. In *R. Lobbii* the receptacle is very short (0.75 mm.) and usually glabrous. The eastern variety of *Ranunculus trichophyllus* (var. *calvescens*) is distinguished from the typical form of the species by its essentially glabrous receptacle. In general, except for *R. Lobbii, R. hederaceus* and *R. trichophyllus,* var. *calvescens,* the receptacle of the North American Batrachian *Ranunculi* is pubescent.

Androecium. Although the shape of the anthers and the relative length of stamens and carpels have often been employed as diagnostic characters, it is probable that the state of maturity of the flower effects such divergences.[1] Thus, these supposed stamineal characters are not of much taxonomic importance. The number of stamens is of some taxonomic significance, though in common with many other characters of the group, it is variable within limits for a given species.

[1] See Freyn, J., *Zur Kenntnis einiger Arten der Gattung Ranunculus* ii., Beil. Bot. Centralbl. vi. nr. 26: 11 (1881).

PERIANTH. The size of the petals of the Batrachian *Ranunculi* is of limited value for classificatory purposes since those of each species, though variable, are of the same general length-range. In two species, *Ranunculus hederaceus* and *R. Lobbii*, the petals are consistently very small (5 mm. in length). In *R. trichophyllus*, however, the size of the petals is much more variable. Finally, in *R. subrigidus*, the veins of the petals are important since they are less forked toward the distal extremity than they are in those of the closely related European *R. circinatus*. The nectarial scales at the base of the petals are, according to Freyn (l. c.), consistently round; but my studies show that the nectaries vary considerably in their development within a given species. Indeed the simple round type is scarcely present in most petals of our North American species. The white color of the petals of the section *Batrachium* is one of the constant characters of the group; but white petals are not confined to the *Batrachium* section, since several species in other sections of the genus also have them. The sepals, while exhibiting several variations in their gross morphology, do not have differences of taxonomic importance.

FOLIAGE. In general the foliage consists of two primary kinds, the dissected, immersed type and the dilated, floating type. In those species which are heterophyllous, all kinds of foliage transitional from one type to the other may be growing even on the same plant. The foliage of the homophyllous species is also very variable. With such foliar variation possible, then, considerable taxonomic discrimination must be exercized in the selection of truly diagnostic foliar characters. The North American plants which are heterophyllous show many variations in their foliage; but, because of the lack of fundamental differences in reproductive structures and since they share a common geographical distribution (western United States and Canada to Alaska), I have concluded that they are better treated as one specific type. Moreover, these heterophyllous North American representatives of *Batrachium* do not offer fundamental distinctions from the more widespread and homophyllous (with dissected, immersed foliage) *R. trichophyllus*. Accordingly, I am treating the American heterophyllous plants as var. *hispidulus* (E. R. Drew) of *R. trichophyllus*. Whether our western plant with heterophyllous foliage is conspecific with the European *R. heterophyllus* Web. is not clear, for the latter appears to be separable in Europe from the types there with dissected immersed leaves.

Among the other dissected-leaved North American species are

Ranunculus longirostris Godr. and my *R. subrigidus*, both of which are characterized by a more or less circinate circumscription of the leaves. In *R. longirostris* the leaves are mostly all sessile at the apex of the stipular sheaths, whereas in *R. subrigidus*, usually the lower and occasionally all the leaves are shortly but definitely petiolate. The leaves of *R. subrigidus*, which has long passed in North America as the European *R. circinatus*, differ from the foliage of the latter in being of a much less rigid texture, and the segments are usually longer.

All the Batrachian *Ranunculi* have stipular sheaths, though variously developed, at the base of the petioles of their leaves. Considerable variation is shown in the morphology of these sheaths, but as specific characters I have not found them of much importance.

MISCELLANEOUS. The presence of adventitious roots, while admittedly a response to severe environmental conditions, appears to characterize the northern plant often passing as *Ranunculus confervoides* Fries. Only rarely do the Batrachia of more temperate regions develop adventitious roots extensively. Similarly, *R. confervoides*, which I am here reducing to a geographic variety, var. *eradicatus* (Laest.), of *R. trichophyllus*, is further characterized by a filiform or very slender stem; but it is doubtful if this character is of much significance.

GEOGRAPHICAL DISTRIBUTION

The section *Batrachium* has a wide geographical distribution. The various species occur chiefly in the temperate regions; *R. trichophyllus*, var. *eradicatus*, however, is found in Greenland as far north as 76° 30′.[1] Another species, *R. pueblensis*, is localized south of the Tropic of Cancer in the highlands of southern Mexico; but, in this case, the altitude (2,000 m.) partially offsets the apparent tropical distribution.

Turning to a consideration of the distribution of the various species in North America, we find significant ranges which, in most cases, can be correlated with those already worked out for many other plants, terrestrial as well as aquatic. One species, *Ranunculus longirostris*, in the East at least, shows a preference for calcareous waters, and it is probable that it and *R. subrigidus* have a similar preference westward. *R. hederaceus* has been reported by Morris[2] in waters which were probably calcareous. As to the soil preferences of the other

[1] From plants (now in the Gray Herbarium) collected at North Bay, 76° 30′ N. Lat., NW. Greenland, by W. E. Ekblaw of the Crocker Land Expedition.

[2] According to Morris, E. L., Proc. Biol. Soc. Wash. xiii. 157–158 (1900), *R. hederaceus* was growing in shallow waters over marly soil.

species, however, I have little accurate field data on which to base general conclusions.

Taking up the distribution of each species in North America, it is found that several types of segregation from and identities with Old World floras are manifest. These various types of distribution may be grouped as follows: first, species confined in North America to the East, but growing also in western Europe; second, species confined to western North America, chiefly endemic; third, species of a fairly general range in North America, also endemic; fourth, species of eastern and western North America and western Europe (and probably eastern Asia as well); and, fifth, plants of more general circumpolar distribution in the northern hemisphere.

Ranunculus hederaceus comprises the first group which, in North America, is confined to the East, but which also occurs in western Europe. In North America, *R. hederaceus* occurs at several stations in Newfoundland, in Bucks County, eastern Pennsylvania, and at certain stations around or near the Chesapeake Bay region of Maryland and Virginia. It has also been reported by Elliott[1] from Charleston, South Carolina, where Bosc discovered the plant about 1821. From the fact that Elliott reported the plant as rare or extinct and because more recent studies of the flora of the southeastern United States do not include *R. hederaceus*, there is a question whether it still exists in South Carolina. Evidently Bosc believed the plant to be naturalized from Europe, for Elliott wrote that it was "apparently naturalized." Gray, in 1871, stated that *R. hederaceus* had all the appearance of being indigenous near Norfolk, Virginia. Morris,[2] however, who discovered a station for *R. hederaceus* at the head of navigation on the Patuxent River, Maryland, presumably regarded the species as introduced from Europe, for he speaks of "The first record by name of station of the introduction of this species from Europe." Thus it may be that *R. hederaceus* is introduced there, but should field studies indicate that the plant is as quiescent or nonaggressive in the Chesapeake Bay region as it is in southeastern Newfoundland, one would have reason to consider it probably indigenous.

From a theoretical standpoint, at least, it is entirely possible that *Ranunculus hederaceus* is indigenous about the Chesapeake Bay region. Its discontinuous distribution in eastern North America, with a gap between eastern Pennsylvania and Newfoundland, is

[1] Sketch Bot. So. Carol. & Ga. ii. 56 (1821).
[2] Proc. Biol. Soc. Wash. loc. cit.

shared by many other plants, as Fernald[1] has repeatedly pointed out. In his latest study, *Recent Discoveries in the Newfoundland Flora,* Fernald concludes that the plants of austral affinities, such as *Schizaea pusilla* Pursh, the *Xyridaceae* and their associates, which also have a discontinuous range in eastern North America, either lived in Newfoundland throughout the Pleistocene or reached Newfoundland in Pre-Wisconsin time either from the North or the South. It was possible for the plants to migrate to Newfoundland from the North because of the existence of the uplifted floor of the North Atlantic basin which connected North America with Europe. Moreover, it was equally possible for these plants to migrate from the South where, presumably, they had been established long before the Pleistocene, along the now submerged continental shelf which forms the Banks of the present time. This latter idea gains force from the results of the investigations on the New England-Acadian Shoreline by Douglas Johnson[2] who finds that the continental shelf and banks cuesta were submerged in "at least post-Miocene, and more probably post-Pliocene." Thus the plants already established in the South would have had little difficulty migrating North along the upraised continental shelf; but the point I wish to emphasize is that it was entirely possible for *R. hederaceus* to migrate southward from Newfoundland along the old continental shelf to the Chesapeake Bay region (and probably to South Carolina) where it now persists in scattered favorable localities.

Returning to a consideration of the situation of *Ranunculus hederaceus* in Newfoundland, it seems pretty clear that the plant is indigenous there, since Fernald[3] has found it to occur in natural and undisturbed habitats, and to share its Old World affinities with many plants. This group of plants probably made their way across the land which is now the floor of the North Atlantic (or at least were continuously distributed from northern Europe across this land bridge to eastern North America) from northern Europe to eastern North America during the long interglacial epoch prior to the Wisconsin glaciation, and have persisted, especially in southeastern Newfoundland where

[1] A Botanical Exp. to Newfoundland and So. Lab., Rhodora xiii. 135–162 (1911); Some Relationships of the Floras of the No. Hemisph., Proc. Int. Cong. Pl. Sci., Ithaca (1926) ii. 1494–1500 (1929); Specific Segregations and Identities in Some Floras of E. No. Am. and the Old World, Rhodora xxxiii. 25–63 (1931); Recent Discoveries in the Newfoundland Flora, Rhodora xxxv. 97–107 (1933).

[2] *The New England-Acadian Shoreline*, 301–304 (1925). N. Y., John Wiley & Sons; London, Chapman & Hall.

[3] Proc. Int. Cong. Pl. Sci. Ithaca (1926) ii 1506 (1929).

the Wisconsin ice was very local, as relic species. Thus, *Ranunculus hederaceus*, probably migrating to North America in early or mid-Pleistocene, was widespread on the now submerged continental shelf to Chesapeake Bay, and with its submergence (post-Miocene or post-Pliocene, but pre-Wisconsin) and the ensuing Wisconsin glaciation became isolated in Newfoundland, the Chesapeake Bay region, and South Carolina.

The origin in North America of the second group of species, those endemic to western North America, is not as clearly correlated with geological history as is that of *Ranunculus hederaceus* of the Atlantic coast. *R. Lobbii* of the coast ranges of California, western Oregon, and Vancouver Island, is, however, the most sharply defined species of any North America member of the *Batrachia*, since in its odd, trilobed, dilated leaves, the very small flowers, and the very few (3–6) achenes which are extremely large and possess a lateral mucro, unlike the fruit of any other *Batrachium*, the plant is unique. Its closest relative is the European *R. tripartitus* DC.; but the latter never has the few large achenes with lateral persistent style-bases and the more or less persistent calyces of *R. Lobbii*.

Gray[1,2] first pointed out the antiquity and relationships of much of the Californian flora, but Jepson[3] and Abrams,[4] with more data at their command, have pointed out the high degree of endemism which characterizes the California plants. Fernald,[5] again, emphasized that there is a considerable group of plants in the northern hemisphere which occur in Europe and Pacific America, but which are absent from eastern Asia and eastern America. The explanation and origin of this type of distribution is not clear; Fernald points out that, although the climate of Pacific America and Atlantic Eurasia are similar, it is difficult to believe that climate alone could have brought about such a segregation. *Ranunculus Lobbii*, then, is a plant endemic to western North America (chiefly California), and like much of the Californian flora is old. Its origin is not clear, except that it is probable that it and its closest relative, *R. tripartitus*, of Europe have evolved from a common progenitor.

Restricted to the Far West, also, is the heterophyllous and endemic extreme of *Ranunculus trichophyllus* which I am treating as *R. tricho-*

[1] Mem. Am. Acad. Arts & Sci. vi. 377–452 (1859).
[2] Proc. Am. Ass. Ad. Sci. xxi. 1–31 (1872).
[3] Man. Fl. Pl. Calif. 10–14 (1925).
[4] Proc. Int. Cong. Pl. Sci. Ithaca (1926) ii. 1520–1524 (1929).
[5] Proc. Int. Cong. Pl. Sci. Ithaca (1926) ii. 1489–1491 (1929).

phyllus, var. *hispidulus*. This plant ranges up the coast to Alaska and occurs as far East as western Montana and Utah. Unlike *R. Lobbii*, whose characters are sharply defined, *R. trichophyllus*, var. *hispidulus* has been a very baffling plant to interpret taxonomically, for certain of its forms appear to be referable to groups which, in Europe, have been treated as distinct species. The American plants seem to be inseparable one from the other, whereas in the Old World species bearing heteromorphic leaves such divergences of several species appear to be distinct. On that account and because I cannot specifically separate our western plant with dilated leaves from *R. trichophyllus*, as the latter occurs in North America, I am treating it as a variety of that species. More extensive studies may show that our western plant with dilated leaves includes one or more Old World types, but, for the present, I believe it is best treated as endemic to our continent. As in the case of *R. Lobbii*, its origin in western North America is not clear. It is probable, however, that *R. trichophyllus*, var. *hispidulus* and its European representatives evolved from a common progenitor, because the plants from both continents are taxonomically closely related.

The third group of species, which are also endemic, are those which are fairly widespread over the chiefly calcareous regions of North America. The most clear-cut of these plants is *Ranunculus longirostris*. This species attains its greatest development in the limy waters of the Great Lakes region, occurring only occasionally in the Southwest. This type of distribution is shown by many plants preferring calcareous soils, as, for example, *Potamogeton strictifolius* Ar. Benn.[1] *Ranunculus subrigidus* also seems to favor waters which are basic; but, curiously enough, it is mostly absent from the calcareous lakes and ponds of the Great Lakes region where *R. longirostris* reaches its greatest development. *R. subrigidus* is more characteristic of the West and Southwest and is much more widely dispersed than *R. longirostris*. Whether *R. subrigidus* is confined to limy waters I am not positive, since my data are incomplete on this subject. At any rate, *R. subrigidus* is very closely related, taxonomically, to the European *R. circinatus*. Presumably, then, *R. subrigidus* and *R. circinatus* had as a common ancestor a plant which was distributed continuously from Europe to North America in Cretaceous or Tertiary time.

The species of the fourth group occur in both eastern and western

[1] *The Linear-Leaved North American Species of Potamogeton*, Mem. Am. Acad. xvii. pt. 1: 55–60 (1932).

North America, as well as in western Europe and probably eastern Asia. *Ranunculus trichophyllus* has a discontinuous range; with rare exceptions, it is absent from most of the Mid-West. In the eastern part of our continent it grows in either basic, neutral or acidic waters, but I have had no personal acquaintance with its habitats in the West. It has a range which, as Fernald[1] has shown, is shared by many other plants, terrestrial as well as aquatic. He has pointed out that such plants as *Potamogeton pusillus, P. epihydrus, Brasenia Schreberi* and others he cites, are chiefly excluded from the Great Plains by alkalinity of the waters. He presupposes a continuous distribution across the continent in median latitudes during Tertiary time and long after the withdrawal of the Cretaceous seas for these aquatic and the many terrestrial plants which share their ranges. Then, with the advent of the Pliocene uplift of the Cordilleran region, which brought about an increase of aridity east of the Pacific slope, the waters naturally became more alkaline, so that the Potamogetons mentioned above, as well as other plants of less alkaline to acid waters, were excluded. With little accurate field data on the soil preferences of *R. trichophyllus*, it is difficult, not to say unwise, to attempt generalizations concerning its distribution; it may be that further studies will indicate that it should be included with those plants just discussed, the distribution of which appears to depend upon proper edaphic conditions.

Finally, another type of distribution is illustrated by the nearly circumpolar *Ranunculus trichophyllus*, var. *eradicatus*. As far as my studies have shown, this arctic and sub-arctic plant is nothing but the extreme northern form of *R. trichophyllus*. Its present distribution in North America is wide, the plant occurring in Labrador, Newfoundland, parts of the Gaspé Peninsula, the James Bay region, northern Wyoming and Alaska. It is fairly common in Greenland, at least on the west coast where it gets as far north as 76° 30′; it is found also in Iceland, northern England, Scandinavia, rarely in the high mountains of France and Italy, and in eastern Eurasia. Such wide arctic and sub-arctic dispersal is characteristic of many plants. It seems to me that *R. trichophyllus*, var. *eradicatus* represents a northern variation of *R. trichophyllus* which gradually evolved from the widespread typical form as the Pleistocene glaciations brought about an increasingly colder climate in the northern areas. This is supported by the fact that it does not differ fundamentally from typi-

[1] *The Linear-Leaved North American Species of Potamogeton*, Mem. Am. Acad. xvii. pt. 1: 27–28 (1932).

cal *R. trichophyllus*, and also because it appears to occur further south in Europe, at least, in alpine regions where the climatic conditions are of near-arctic severity.

Synoptic Treatment of the North American Species

My thanks are especially due to the United States National Museum and the University of California for loan of their collections. I also wish to extend my thanks to Dr. Cotton of the Royal Botanical Gardens at Kew, England, for placing their collection at my disposal. Dr. Pennell of the Academy of Natural Sciences at Philadelphia and Dr. Merrill of the New York Botanical Garden have most kindly lent me the plants which comprise the original collection of *Ranunculus Porteri* Britton. In this paper, the material from the Gray Herbarium and from the Herbarium of the New England Botanical Club has not been specially indicated. Other collections are indicated as follows: Boston University (B. U.), United States National Herbarium (U. S.) and University of California (Cal.).

In this paper I am regarding *Batrachium* as a section of *Ranunculus* and not as a separate genus, because the definitive characters of *Batrachium*, in the final analysis, are not restricted to it. Whether *Batrachium* should be considered a section or a sub-section under *Ranunculus* is a question I am in no position to answer, because I am not familiar enough with the other plants of the genus. Prantl[1] has arranged the species of *Ranunculus* according to a system which is based on a wide knowledge of the group, and upon evidence derived from morphological as well as taxonomical investigations. According to this well-established system, *Batrachium* is a sub-section under the section *Marsypadenium*.

Key to the Indigenous North American Species and Varieties of Ranunculus § Batrachium

a. Plants with dilated floating leaves only, shallowly 3–5-lobed, subtruncate at the base with wide sinuses: achenes glabrous: receptable glabrous . . . . 1. *R. hederaceus.*

a. Plants with dilated floating leaves and dissected immersed leaves, or only the latter; dilated leaves variously, but not shallowly 3–7-lobed: achenes hairy or glabrous: receptacle hairy (except in *R. Lobbii* and *R. trichophyllus*, var. *calvescens*) . . . . *b.*

b. Blades of dissected immersed leaves all usually petioled above the stipular sheaths, collapsing when withdrawn from water; stipular sheaths narrow except on the immature leaves, mostly adnate to the petioles . . . . *c.*

[1] Prantl, K., Beit. Morph. Syst. Ranunc., Bot. Jahrb. ix. 263–268 (1888).

c. Dissected immersed leaves rudimentary and few, usually near the base of the plant: carpels usually 2–6 (av. 3); persistent style-base chiefly lateral to sublateral, inconspicuous . . . . 2. *R. Lobbii.*

c. Dissected immersed leaves various, usually well developed: carpels 8–40; persistent style-base terminal to sublateral, never lateral, mostly conspicuous . . . . *d.*

d. Dilated floating leaves developed; plants of western North America . . . . 3. *R. trichophyllus*, var. *hispidulus.*

d. Dilated floating leaves undeveloped . . . . *e.*

e. Stems rarely filiform, not usually rooting at many of the nodes; segments of dissected leaves rarely filiform: stamens mostly 10–15: achenes usually very rugose . . . . *f.*

f. Receptacle mostly long-hairy: achenes 1.25–1.5 mm. long, frequently hairy at maturity . . . . 4. *R. trichophyllus*, var. *typicus.*

f. Receptacle essentially glabrous: achenes 1.5–1.75 mm. long, glabrous at maturity: plants of eastern North America . . . . 5. *R. trichophyllus*, var. *calvescens.*

e. Stems filiform, rooting extensively at the nodes: segments of the dissected leaves filiform: stamens usually 5–10: achenes often smooth: plants arctic, subarctic and arctic-alpine . . 6. *R. trichophullus*, var. *eradicatus.*

b. Blades of dissected leaves sessile above the stipular sheath to rarely petiolate, often remaining firm on withdrawal from water; stipular sheaths mostly broad and well developed on the majority of the leaves, rarely completely adnate to the petioles . . . . *g.*

g. Achenes not over 1.6 mm. long, exclusive of the persistent style-base, rather finely rugose; beak not stout and recurved: first divisions of the leaves not long-stalked . . . . *h.*

h. Persistent style-base forming a short beak (0.2–0.5 mm.) at maturity; achenes very many (30–80), but usually about 40, averaging 1.25 mm. in length: stipular sheaths pubescent or not, usually ¾ to completely adnate to the petioles . . . . 7. *R. subrigidus.*

h. Persistent style-base forming a long beak (± 1 mm.); achenes several to many (8–30), but usually about 16, averaging 1.5 mm. in length: stipular sheaths very hairy, usually ¼–¾ adnate to the petioles . . . . . 8. *R. longirostris.*

g. Achenes 2–2.75 mm. long, exclusive of the persistent style-base, rather coarsely rugose; beak rather stout and more or less recurved: first divisions of the leaves very long (0.6–1 cm.)-stalked . . . . 9. *R. pueblensis.*

1. RANUNCULUS HEDERACEUS L. Stems creeping, with adventitious roots at many of the nodes: dilated leaves only present; blades more or less reniform, shallowly lobed into 3–5 segments; petioles with rather membranaceous, ½–⅔ adnate stipular sheaths: flowers 4–7 (usually 5–6) mm. in diameter: petals 3–5-veined: stamens 6–10: carpels 10–16 (av. 12), mostly glabrous; mature achenes 1–1.5 (av. 1.25) mm. long, sharply keeled all around, absolutely glabrous and prominently rugose; persistent style-base small, subterminal to sublateral: receptacle 1–1.5 (av. 1.25) mm. long, entirely glabrous.—Sp. Pl. 556 (1753); Oeder, Fl. Dan. ii. fasc. vi. 3, t. 321 (1766); Biria,

Hist. Renonc. 33 (1811); Reichenb. Ic. Fl. Germ. iii. t. 2 (1838–39); Gren. & Godr. Fl. Fr. i. 19 (1847); Bab. Man. Brit. Bot. ed. 4: 8 (1856); Gray, Syn. Fl. No. Am. i. 22 (1895); Rob. & Fern. in Gray, Man. ed. 7: 394 (1908); Hegi, Ill. Fl. Mitt.-Eur. iii. 577, t. 118, f. 7 (1912); Pearsall, Bot. Soc. & Exch. Club Brit. Isl. Rep. viii. 837 (1928). *R. Hederaefolius* Salisb. Prod. Stirp. 373 (1796). *Batrachium hederaceum* (L.) S. F. Gray, Nat. Arr. Brit. Pl. ii. 721 (1821). *R. hydrocharis, β. Homoiophyllus, α. Hederaceus* Spenn. Fl. Frib. iii. 1008 (1829). *B. omiophyllus* Tenore, Fl. Neapol. iv. 338 (1830).[1] *R. hydrocharis,* forma *hederaefolius* (Salisb.) Hiern, Journ. Bot. ix. 67 (1871). *R. hederaceus* L., var. *hederaefolius* (Salisb.) Lawson, Trans. Roy. Soc. Canada, ii. sect. iv: 44–45 (1884), excluding synonym *R. aquatilis,* var. *arcticus* Durand.—In shallow water and wet shores, Newfoundland; Chester Co., Pennsylvania; Maryland; southeastern Virginia; South Carolina; western Europe. The following are typical: NEWFOUNDLAND: Open Hall Cove, Bonavista Bay, Aug. 16, 1879, *H. L. Osborn* (U. S.), distributed as *R. hyperboreus* Rottb.; shores of Quiddy Viddy Lake, *Robinson* & *Schrenk*, no. 31; between Quiddy Viddy and Middle Cove, *Fernald* & *Wiegand*, no. 5423; Murray's Pond, July, 1931, *Agnes M. Ayre;* Bishop Field Grounds, St. John's, July, 1931, *Agnes M. Ayre;* New Harbour, 1890, *Waghorne;* by spring in gravel beach, Carbonear, *Fernald* & *Wiegand*, no. 5424. PENNSYLVANIA: growing in shallow water along road near Lee's Bridge, Chester Co., *Hans Wilkens,* no. 161. MARYLAND: Mt. Calvert, Prince George Co., *Shreve,* no. 1556 (U.S.); swamp south of the confluence of its western branch with the Patuxent River, Prince George Co., *E. L. Morris,* no. 919 (U.S.); along the Patuxent River for four miles below its western branch, Prince George Co., *E. L. Morris* no. 1407 (U.S.). VIRGINIA: shaded spring bog, Hampton, May 18, 1903, *G. S. Miller, Jr.* (U.S.); south of Virginia Beach, Princess Anne Co., May 26, 1893, *Britton* & *Small* (U.S.); Hampton, 1878, *Vasey* (U.S.); Norfolk, *L. F. Ward,* no. 826 (U.S.); Dismal Swamp, 1877, *Chickering* (U.S.); Chesapeake City, May 12, 1877, *L. F. Ward* (U.S.); Hampton, May 14, 1877, *Morong* (U.S.); wet sand bordering swampy woods and thickets back of the dunes, along Back Bay, south of False Cape, Princess Anne Co., *Fernald* & *Long,* no. 3937.

This species is worth more than passing mention in this study because of the interest attached to its various discoveries in North America, and for its significant geographical distribution which I have discussed in the preceding pages. The first collection of the species in North America was made about 1821 at Charleston, South Carolina, where Bosc discovered the plant, according to Elliott.[2] His note seems to have escaped the attention of later botanists and, apparently, the plant has not subsequently been reported in South Carolina.

[1] According to Pearsall, l. c.

[2] Sketch Bot. So. Carol. & Ga. ii. 56 (1821).

Thus, Gray[1] wrote, erroneously, as it now appears, that *R. hederaceus* was first collected on this continent near Norfolk, Virginia, where J. M. M. Muir found it in 1870. In the next few years following 1870, *R. hederaceus* was discovered at "Chesapeake City," near Hampton, Virginia, by Dr. L. F. Ward in 1877 and, during the same year, in Dismal Swamp, Virginia, where it was found by Chickering. The next new locality in Virginia was at Virginia Beach, Princess Anne Co., where Britton and Small collected it in 1893. Meanwhile, however, a significant range-extension was made by Dr. H. L. Osborn in 1879, when he collected the plant in Open Hall Cove, Bonavista Bay, Newfoundland. Through the kindness of the United States National Herbarium, I have been able to examine Osborn's plant which is unquestionably *R. hederaceus.* Presumably Gray, at the time (1886) of his Revision of the North American Ranunculi (l. c.) was unfamiliar with Osborn's plant, for he wrote under the discussion of *R. hederaceus*, that although it was said to be apparently indigenous at many stations near Norfolk, Virginia,[2] the fact that it occurred nowhere else indicated that it was an introduction from Europe. However, in the treatment in the Synoptical Flora of North America i. 22 (1895), Gray's earlier opinion (1886), that *R. hederaceus* was a European introduction, was maintained by the editor even though, at that time, it had been collected by Waghorne in 1889 and 1890 near New Harbour, Bonavista Bay, Newfoundland;[3] by Miss Southcott at St. John's, Newfoundland, in 1893;[4] and by Robinson & Schrenk on the shores of Quiddy Viddy Lake, Newfoundland, in 1894.[5]

Since the publication of the Synoptical Flora, many new stations for the plant have been discovered. Morris, in 1900,[6] found the species in a swamp near the head of navigation on the Patuxent River, Prince George Co., Maryland. Numerous other collections

[1] Gray wrote, in the note describing the discovery for the "first time" in North America of *Ranunculus hederaceus*, that it was collected by the late Dr. Munn (Am. Journ. Sci. & Arts ser. 3, ii. 476 (1871). Subsequently, in his *Revision of the North American Ranunculi* (Proc. Am. Ac. Arts & Sci. xxi. 364 (1886), Gray stated that it was first collected by Muir in 1870. The original collection, now in the Gray Herbarium, bears the name of J. M. M. Muir as collector. Probably, then, Muir was actually the collector, and not Munn.

[2] As a matter of fact, Gray wrote earlier (1871, l. c.) that *R. hederaceus*, when "first" discovered in North America near Norfolk, Virginia, had all the appearance of being indigenous.

[3] Bot. Gaz. xvi. 285 (1891).

[4] Trans. Nov. Scot. Inst. Sci. ser. 2: i. 363 (1893).

[5] Notes on Fl. Newf'd., Can. Rec. Sci. vii. 7 (1896).

[6] Proc. Biol. Soc. Wash. xiii. 157 (1901).

from Carbonear on the shores of Conception Bay and the general vicinity of St. John's, Newfoundland, have added to the known stations for this plant in Newfoundland. More recently (1929), Wilkens discovered a station much further inland at Lee's Bridge, Chester Co., Pennsylvania,[1] and in 1934 Fernald & Long found it with strictly indigenous species on wet sands of Back Bay, near the North Carolina border, south of False Cape, Virginia.

It is evident, then, that *R. hederaceus* was much more widespread than Gray knew when he first revised the North American *Ranunculaceae* (l. c.). Robinson & Schrenk, in "Notes on the Flora of Newfoundland," (l. c.) came to the conclusion that the evidence at that time (1896) was not clear as to whether *R. hederaceus* was indigenous, especially since their stations were near a prominent port. Later and more thorough botanical explorations in Newfoundland, however, indicate that *R. hederaceus* occurs at many stations on the Avalon Peninsula. Thus, Fernald[2] has pointed out in "Some Relationships of the Floras of the Northern Hemisphere" that *R. hederaceus* is apparently indigenous in Newfoundland, especially since it shares natural and undisturbed habitats with or near many other European types, such as *Potamogeton polygonifolius* Pourret, *Glyceria fluitans* R. Br., *Sieglingia decumbens* Bernh., *Nardus stricta* L., *Calluna vulgaris* (L.) Hull, and *Pedicularis sylvatica* L.

Although Hiern (l. c.) stated that *Ranunculus hederaceus* reaches the Rocky Mountains, where it has "larger flowers and more numerous stamens than in the type," neither extant specimens nor records of the plant in recent floristic studies of the region are known. Indeed the material in the Gray Herbarium, the United States National Herbarium, the Herbarium of the University of California, and the Kew Herbarium includes no authentic specimens of *R. hederaceus* from the Rocky Mountain region or, for that matter, the West as a whole. It seems probable, then, that Hiern was dealing with some other species.

Lawson (l. c.) interpreted Durand's[3] *Ranunculus aquatilis*, var. *arcticus*, from "Disco and adjacent coast, 70°," as *R. hederaceus;* but

[1] *Pennsylvania:* growing in shallow water, along road near Lee's Bridge, Chester Co., *Hans Wilkens*, no. 161. (Distributed by the Philadelphia Academy of Sciences).

[2] Proc. Int. Cong. Pl. Sci. Ithaca (1926) ii. 1506 (1929).

[3] Durand, in the Plantae Kaneanae Groenl., Journ. Acad. Nat. Sci. Philadel. iii. 185 (1856), published a new *Ranunculus*, *R. aquatilis* L., var. *arcticus* from "Disco and adjacent coast, 70°." Durand stated that his plant has a great affinity with DeCandolle's "*R. aquatilis*, var. *hederaceus*, *R. hederaceus*, Lam., not of Linn." No plate accompanies the description, and I have seen no specimen, so that I must rely on Porsild's statement as to the nature of Durand's plant.

Porsild[1] has not found *R. hederaceus* either on Disko Island or the adjacent coast, although it is certain that he would have done so if it actually grew there. He has no doubt whatever that the plant which Durand collected was *R. hyperboreus* Rottb., in which the "flowers often become white during drying, especially when the specimens are laid in the press in wet condition." Thus it seems very probable that *R. hederaceus* L. is confined in North America to Newfoundland and to scattered stations from Pennsylvania to southeastern Virginia.

2. R. Lobbii (Hiern) Gray. Plants with heteromorphic leaves, both dilated and dissected; leaves all petioled with well developed stipular bases one-half to completely adnate; dilated leaves deeply tripartite, with the lobes at nearly right angles to each other, and secondarily, shallowly, though sharply notched; dissected leaves few, usually rudimentary and confined to the lower nodes: flowers 0.6–1.5 cm. in diameter: veins of the petal 4–6 (av. 5): stamens 12–16 (av. 12) in number: carpels 2–5 (av. 3) per fruiting head, absolutely glabrous; mature achenes 2–2.6 (av. 2.25) mm. long, glabrous, more or less inflated, oblong-ovate, with rugosities more or less continuous and sharply delineated from the surface; persistent style-base short and definitely lateral: receptacle 0.5–1 (av. 0.75) mm. long, conical, thick, not at all narrowed at the base and entirely glabrous.—Proc. Am. Acad. xxi. 364 (1886) and Synop. Fl. i. pt. 1: 22 (1895); Jepson, Man. Fl. Pl. Calif. 391 (1925). *R. hederaceus* L., var., Torrey, Rep. Whipple Exp. 102 (1857); *R. hydrocharis* Spenn., forma *Lobbii* Hiern, Journ. Bot. ix. 66, t. 114 (1871). *R. aquatilis* L., var. *Lobbii* (Hiern) Watson, Bibl. Ind. 17 (1878). *R. hederaceus* L., var. *Lobbii* (Hiern) Brewer & Wats. Bot. Cal. i. 5 (1876); Lawson, Trans. Roy. Soc. Can. ii. sect. iv: 44 (1884). *Batrachium Lobbii* (Hiern) Howell, Fl. Nw. Am. i. 13 (1897).—Vancouver Island, western Oregon, and western California, where it grows chiefly in pools and quiet waters. The following are representative: California: Mt. Tamalpais, Marin Co., *Eastwood*, no. 3163 (U.S.); St. Helena, Napa Co., *C. F. Baker*, no. 1997 (U.S.); Black Mountain, Santa Clara, *Elmer*, no. 4734 (U.S.); Sonoma Valley, *Jepson*, no. 5083 (U.S.); Windsor, Sonoma Co., *Sidney S. Holman*, 1884 (U.S.); near Windsor, Sonoma Co., *Heller* & *Brown*, no. 5060 (U.S.); 35th parallel of Latitude, 1853–4, *J. M. Bigelow* (U.S.); pond on hill, 2 miles south of San Pablo, Apr. 17, 1888, *Greene* (U.S.); Vacaville, 1892, *Jepson* (U.S.); Byron Springs, March 25, 1888, *Greene* (U.S.); in shallow stagnant water, on Tomalis Bay, Apr. 1886, *Greene;* Mt. Tamalpais, Marin Co., April, 1899, *Eastwood;* North Berkeley Hills, San Francisco Bay Region, *Chandler*, no. 787; Fairfax, Marin Co., Apr. 14, 1895, *Eastwood;* pond in Bolinas, Marin Co., Apr. 15, 1891, *Chestnut* & *Drew* (Cal.); Valley Ford, Sonoma Co., 1906, *Emma Sobenstein* (Cal.); Glen Ellen, Sonoma Co., *M. S. Baker*, no. 603 (Cal.); pool near Olema, Marin Co., Apr. 27, 1931, *L. S. Rose*

[1] Meddel. om Grönl. lviii. 79 (1926).

(Cal.); Alfine School House, San Mateo Co., *Elmer*, no. 4734 (Cal.); ponds in Upper Napa Valley, near Calistoga, May 1, 1893, *Jepson* (Cal.); Glenwood, Santa Cruz Co., May 1893, *Michener* & *Bioletti* (Cal.); Healdsburg, Apr. 1897, *Alice King* (Cal.); Cajadero, Sonoma Co., *J. Burt Davy*, no. 1659 (Cal.); Sebastopol, Apr. 26, 1893, *Eastwood* (Cal.); OREGON: shallow pool in pasture at end of Brook Lane, Corvallis, April 23, 1934, *Gilkey*. VANCOUVER ISLAND: vicinity of Victoria, *John Macoun*, no. 77,391; Colwood, May 21, 1919, *C. F. Newcombe;* Oak Bay, May 9, 1901, *N. S. Gardner* (Cal.).

Ranunculus Lobbii is one of the most sharply defined of any of the North American *Batrachia.* In the paucity of carpels (3–6), the large glabrous achenes with lateral beaks, and the distinctly tripartite dilated leaves, it stands apart from all the North American members of the group. Gray,[1] who had seen very few specimens of this *Ranunculus,* noted that it had sharply defined style-characters, but that, contrary to what Torrey had earlier (1857) reported, the style was never lateral, either in flower or at a later period. My observations indicate that, at least in fruit, the style-base is usually definitely lateral (FIG. 12) unlike that of the achenes of any other *Batrachium.* In the large size (2.25 mm. ±), the very few achenes, and the distinctly lateral beak in fruit, *R. Lobbii* is clearly separated from the European *R. tripartitus,* considered by many students to be its closest relative. Some of the earlier authors regarded *R. hederaceus* as the nearest relative of *R. Lobbii,* even going so far as to include them under one species; but, again, the fruit characters of *R. Lobbii* and the fact that it usually bears dissected, immersed foliage, though often rudimentary, clearly distinguish it from *R. hederaceus. R. Lobbii,* then, is a species endemic to western North America.

It is of interest to note that Hiern[2] originally described this plant as a form under his inclusive *Ranunculus hydrocharis* Spenn. Hiern's plant, which was collected by W. Lobb in Oregon (no. 249), is now in the Kew Herbarium where I have examined it. Apparently *R. Lobbii* centers chiefly upon the coast ranges of Mid-California, although it is also in western Oregon and on Vancouver Island.

3. R. TRICHOPHYLLUS Chaix. Leaves dilated and floating or dissected and immersed, with transitional forms common; dilated leaves variously lobed, chiefly confined to the upper nodes, subtended by broader, less completely adnate and more pubescent stipular sheaths than the dissected leaves; dissected leaves of varying length, shape, and disposition about the stem, usually collapsing out of water; stipular sheaths generally narrow, one-half to completely adnate, except

[1] Proc. Am. Acad. xvi. l. c.

[2] Journ. Bot. ix. loc. cit.

when quite young; upper internodes, petioles and lower leaf-segments often hairy: flowers varying from 0.7 to 1.7 (usually 1.2–1.5) cm. in diameter; petals not usually contiguous, exceeding the calyx by about 2–2.5 times; veins of the petal variable, ranging from 3 to 9 (usually 5–6 for eastern forms and 3–4 for the western ones): stamens 5 to 16 (usually 10–12): carpels 8 to 35 (usually 16–24), with often several abortive at maturity; achenes 1 to 2 (usually 1.25–1.5) mm. long, hairy or not; summit of style mostly deciduous, leaving a short persistent beak subterminal to sublateral in position: receptacle 0.5 to 2.6 (usually 1.–1.5) mm. long, pubescent or not.—A very variable plant found in temperate and cold regions. Its many forms have often been described as distinct species, especially in Europe. In North America at least three varieties and several forms can be distinguished.

R. TRICHOPHYLLUS Chaix, var. **typicus** (Figs. 6, 13). *R. trichophyllus* Chaix in Villars, Hist. Pl. Dauph. i. 335 (1786); Grenier & Godron, Fl. France i. 23–24 (1847); Bab. Man. Eng. Bot. ed. 5: 5–6 (1862); Sm. & Sowerby, Engl. Bot. Suppl. v. no. lxxvii, t. 2968 (1863); Coste, Fl. Fr. i. 22 (1901); Pearsall, Bot. Soc. & Exch. Club Brit. Is. Rep. viii. 818–819 (1928). *R. aquatilis* L., var. γ L. Sp. Pl. i. 556 (1753), in part. *R. foeniculaceus* Gilib. Fl. Lithuan. iv. 261, n. 177 (1782), in part, according to F. N. Williams. *R. divaricatus* Schrank, Baierische Fl. ii. 104, n. 859 (1789), in part, not as interpreted by early European authors. *R. flaccidus* Pers. in Usteri, Ann. d. Bot. xiv. 39 (1795), in part. *R. capillaceus* Thuill. Fl. Env. Paris, ed. 2: 278 (1799), in part. *R. pantothrix* Brotero, Fl. Lusit ii. 375 (1804), in part, excluding synonyms *R. aquatilis* L., var. β & δ. *R. paucistamineus* Tausch, in Flora xvii. 525 (1834), in part, of English authors. *R. aquatilis* L., var. *brachypus* Hook. & Arn. Bot. Beech. Voy. pt. 7: Calif-Suppl. 316 (1840). *Batrachium trichophyllum* (Chaix) Van d. Bosch, Prod. Fl. Bat. i. 5 (1850). *R. hydrocharis* Spenn., forma *trichophyllus* (Chaix) Hiern, Journ. Bot. ix. 101 (1871). *R. aquatilis* L., var. *Drouetii sensu* Lawson, Trans. Roy. Soc. Can. ii. 45–46 (1884). *R. Porteri* Britton, Bull. Torr. Bot. Club xvii. 310 (1890). *B. pedunculare* Greene ex C. F. Baker, West Am. Pl. ii. 8 (1903), name only; Leaflets Bot. Obs. & Crit. i. 95 (1904). *B. Bakeri* Greene ex C. F. Baker, West Am. Plants i. 7 (1902), name only; Leaflets Bot. Obs. & Crit. i. 95 (1904). *R. aquatilis* L., var. *Bakeri* (Greene) Jepson, Man. Flr. Pl. Calif. 391 (1925). *R. aquatilis* L., var. *pedunculare* (Greene) Jepson, loc. cit. (1925).—A common plant in streams and ponds, from Labrador, Newfoundland, Quebec, and Nova Scotia, occasionally in New England, south to northern New Jersey; Minnesota, Alberta, west to the coast from Lower California to Alaska, south to New Mexico and Arizona; Eurasia; Cape of Good Hope; temperate South America. The following are representative: LABRADOR: Rama, *A. Stecker*, no. 331; Anatolak, *Sewall*, no. 510. NEWFOUNDLAND: in a cold brook four miles northeast of Port à Port, *Mackenzie & Griscom*, no. 10284; Otter Pond Brook, Brig Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28248; in dead water near tide-limit,

East Brook, St. Barbe Bay, *Wiegand* & *Hotchkiss*, no. 28249; limestone barrens, Sandy (or Poverty) Cove, Straits of Belle Isle, *Pease* & *Griscom*, no. 28243; gravelly margin of brook, flowing through clay, slates, sandstones, and quartzites, Upper Gully, Killigrew's, *Fernald* & *Wiegand*, no. 5420. QUEBEC: Rivière aux Becscies, Anticosti, *Victorin* & *Rolland*, no. 25631; La Madeleine, Gaspé Co., *Rousseau*, no. 31089; in a deep quiet brook, Bradore, Saguenay Co., *Fernald* & *Wiegand*, no. 3407; Five Mile Rapids, Roberval, Saguenay Co., July 16, 1892, *Geo. G. Kennedy;* fresh pools near mouth of Dartmouth River, Gaspé Co., *Collins*, *Fernald*, & *Pease*, n. 5229; Rivière Petite Cascapedia, Bonaventure Co., *Victorin, Rolland* & *Jacques*, no. 33,822; estuaire de la Rivière York, Gaspé Co., *Victorin, Rolland, Brunel* & *Rousseau*, no. 17352; Sargents Bay, Lake Memphramagog, Aug. 1, 1903, *Churchill;* fresh-water pond near beach at Point Comfort, South Coast, James Bay, *David Potter*, no. 357; environs d'Ottawa, *Victorin*, no. 10084 (U.S.); Lac à la Truite, *Victorin*, no. 11279 (U.S.). PRINCE EDWARD ISLAND: brook near Village Green, Queens Co., *Fernald*, *Long* & *St. John*, no. 7478, a form with unusual long-segmented, dissected leaves. NEW BRUNSWICK: Nashwaak Bridge, July 20, 1932, *Pease* & *Goodale;* near St. John River above Connors, St. Francis Parish, Madawaska Co., *A. H. Moore*, no. 1302. NOVA SCOTIA: lowlands near Dingwall, Cape Breton Isl., *Nichols*, No. 941; Cape Breton Isl., *Macoun*, no. 19016; muddy lagoon, Charcoal, Pictou Co., *St. John*, no. 1421; pond, North Mountain, Aspy Bay, Cape Breton, July 23, 1909, *Churchill.* MAINE: St. Francis, Aug. 26, 1893, *Fernald;* Fort Kent, 1881, *Kate Furbish*, approaching var. *calvescens.* NEW HAMPSHIRE: Mud Pond, Connecticut Lakes, *Kendall, Goldsborough* & *Doolittle*, no. 1 (U.S.). CONNECTICUT: running brook, Vernon, June 15, 1932, *C. C. Hanmer.* NEW JERSEY: Peters Valley, Sussex Co., June 1, 1895, *Van Sickle* (U.S.). PENNSYLVANIA: without statement of locality or collector, U.S. no. 809. MINNESOTA: Vermillion Lake, *Sandberg*, no. 475 (U.S.). SOUTH DAKOTA: Merritt Ranger Station, Black Hills National Forest, *Murdoch*, no. 4312; Black Hills, near Ft. Meade, *Forwood*, no. 342 (U.S.). ALBERTA: prairie ponds, Castle Hill District, *Marion E. Moodie*, no. 1134 (U.S.); south of Castor, Stettler District, *Brinkman*, no. 2404 (U.S.), an intermediate form between *R. subrigidus* and *R. trichophyllus.* MONTANA: Rattlesnake, Missoula, *Kirkwood*, no. 1123; Jack Creek Canon, *Rydberg* & *Bessey*, no. 4135; Cliff Lake, Madison Co., *Rydberg* & *Bessey*, no. 4133; Swift Current Lake, McDermott, *B. Maguire*, no. 767; Big Fork, Flathead Lake, July 15, 1908, *Mrs. Joseph Clemens;* along Swift Current Creek, below Lake McDermott, Glacier National Park, nos. 16876 & 17430 (U.S.); sloughs, Midvale, *Umbach*, no. 218 (U.S.); Rost (?) Lake, *MacDougal*, no. 674 (U.S.); Flathead Plains, *MacDougal*, no. 456 (U.S.), transitional to var. *hispidulus;* Gallatin River, *Blankinship*, no. 15 (U.S.); Drummond, July 16, 1901, *Scheuber* (U.S.); vicinity of Snyder Lake and along Snyder Creek, Glacier National Park, *Standley*, no. 17959 (U.S.); Gallatin Valley, near

Bozeman, *Flodman*, no. 481 (U.S.); Bigfork, *M. E. Jones*, no. 7997 (U.S.). IDAHO: near Lakeview, Kootenai Co., Aug. 1–10, 1892, *Heller;* Hope, Lake Pend d'Oreille, *Sandberg, MacDougal* & *Heller*, no. 934; forks of St. Mary's River, *Leiberg*, no. 1169, transitional to var. ***hispidulus;*** ponds at Lapwai Agency, Nez Perces Co., *Sandberg, MacDougal* & *Heller*, no. 131; Tamarack, Washington Co., *June A. Clark*, no. 174; St. Anthony, *Merrill* & *Wilcox*, no. 858; Willow Creek, Big Camas Prairie, *Henderson*, no. 3371 (U.S.); valley of Traille River, Kootenai Co., *Sandberg, MacDougal* & *Heller*, no. 882 (U.S.); Lewiston, Nez Perces Co., *Heller*, no. 3142 (U.S.); near Moscow, June 21, 1894, *Henderson* (U.S.); small pond Cougar Gulch, Coeur D'Alene, *H. J. Rust*, no. 393 (U.S.); Goose Cr., Washington Co., *M. E. Jones*, no. 6137 (U.S.). WYOMING: warm waters of Nez Perces Creek, Yellowstone Park, *Nelson*, no. 6251; Hawks Ranch, twenty-five miles south of Laramie, July 2, 1918, *Churchill;* Soda Butte, *A.* & *E. Nelson*, no. 5860; Kendall, Sublette Co., *E. B.* & *L. B. Payson*, no. 2935; Gardiner River, Yellowstone Park, July 26, 1888, *F. H. Knowlton* (U.S.); Norris Geyser Basin, Yellowstone Nat. Park, *Mearns*, no. 3030 (U.S.); Yellowstone Lake, *Tweedy*, no. 906 (U.S.); Glen Creek, Swan Lake, *Mearns*, no. 2903 (U.S.); Plumbago Canon, Aug. 26–27, 1899, *Schuchert* (U.S.). COLORADO: below Carson, Gunnison Watershed, *Baker*, no. 320; Lake Creek, *Wolf* & *Rothrock*, no. 115; in shallow water, Buena Vista, Chaffee Co., *Biltmore Herbarium Colo. Exped.*, no. 3230a (U.S.); Steamboat Springs, *Shear* & *Bessey*, no. 4034 (U.S.); in Grand Lake, *Shear* & *Bessey*, no. 3986 (U.S.). UTAH: Wasatch Mts., *S. Watson*, no. 14; in pond, Aspen Zone, Twelve Mile Canon, Wasatch Mts., *Tidestrom*, no. 515 (U.S.). NEVADA: Ruby Valley, *S. Watson*, no. 14; Truckee River, Reno, *Tidestrom*, no. 10600 (U.S.); Battle Mountain, *A. E. Hitchcock*, no. 589 (U.S.). NEW MEXICO: Chusca Mts., San Juan Co., *A. Wetmore*, no. 532 (U.S.); Rio de las Casas, *Arsène*, no. 19161 (U.S.); Navajo Indian Reservation, in the Tunitcha Mts., *Standley*, no. 7601 (U.S.); Taos, Aug. 8, 1910, *Wooton* (U.S.). ARIZONA: Little Colorado River, *Goodding*, no. 643; Verde Valley, July 28, 1891, *MacDougal* (U.S.). CALIFORNIA: Big Manachi Meadows, *Rothrock*, no. 304; Claremont, Mar. 11, 1896, *Jepson;* Sierra Co., *Lemmon*, no. 3; Bartlett Springs, *Mrs. A. McCallum;* Deer Park, Lake Tahoe Region, *Eastwood*, no. 454; ponds at 1500 ft., Mt. Diablo, *Hall*, no. 1743; Presidio, San Francisco Co., *Michener* & *Bioletti*, no. 162; Susanville, June 29, 1897, *M. E. Jones;* Sacramento Valley about 5 miles northwest of Hamilton on the road to Orland, Glenn Co., *Heller*, no. 11348; valley of Trinity River near mouth of Willow Creek, Humboldt Co., *J. P. Tracy*, no. 3486 (U.S.); Pine Ridge, Fresno Co., *Hall* & *Chandler*, no. 328 (U.S.); near Sonoma, *Brewer*, no. 970 (U.S.); Mt. Shasta, Siskiyou Co., July 1–15, 1897, *H. E. Brown* (U.S.); Talmadge's Meadow, San Bernardino Co., *Parish*, no. 3397 (U.S.); Feather River, Plumas Co., June 1878, *Mrs. R. M. Austin* (U.S.); near Three Rivers, Tulare Co., *Coville* & *Funston*, no. 1208 (U.S.); Cabot Meadow, Stanislaus Forest,

Alpine Co., *Eggleston*, no. 9688 (U.S.); Waverley, *J. A. Sanford*, no. 359 (U.S.); Mt. Diablo, Contra Costa Co., *Elmer*, no. 4318 (U.S.); foot of Bloody Canon, Mono Co., July 19, 1889, *Chestnut & Drew* (Cal.); Laguna, *Cleveland*, no. 328 (Cal.); Snow Mt., Lake Co., June–Aug. 1892, *Mr. & Mrs. T. S. Brandegee* (Cal.); Noble Mine, San Diego Co., *Chandler*, no. 5502 (Cal.); small pools, Garner Ranch, Hemet Valley, San Jacinto Mts., *Munz & Johnston*, no. 5522 (Cal.); shallow pools near east end of lake, Bear Valley, San Bernadino Mts., *Munz*, no. 5706 (Cal.); Pilarcitos Lake and Canon, San Mateo Co., *Davy*, no. 1130 (Cal.); Medicine Lake, Siskiyou Co., *M. S. Baker*, no. 470 (Cal.); Laynes Ranch, April 29, 1909, *K. Brandegee* (Cal.). OREGON: in Des Chutes River, Lapine, Crook Co., *Peck*, no. 9626; Farewell Bend, Crook Co., *Leiberg*, no. 451; east side Harney Valley, *Leiberg*, no. 2372; Multnomah Co., *T. J. Howell*, no. 5; in a pool near Minam River, *Sheldon*, no. 8750 (U.S.); in a sluggish stream near Enterprise, Wallowa Co., *Cusick*, no. 2259 (U.S.); Yamhil Co., *Mrs. B. W. Summers*, U.S. no. 1,391,372; vicinity of Laidlaw, Crook Co., *Whited*, no. 3067 (U.S.); near Wimer, Jackson Co., *E. W. Hammond*, no. 7 (U.S.). WASHINGTON: Waitsburg, *Horner*, no. 41 (U.S.); near Rock Ck., Spokane Co., *Sandberg & Leiberg*, no. 90, transitional to var. *hispidulus;* Harrington, Lincoln Co., *Sandberg & Leiberg*, no. 320; in slow streams, Falcon Valley, *Suksdorf*, no. 1960, transitional to var. *hispidulus;* Lake Ozette, Clallam Co., *J. W. Thompson*, no. 9420; "Box Canon," Pend d'Oreille River, *Kreager*, no. 395; Tacoma, May 1, 1908, *A. B. Leckenby* (U.S.); Lake Chelan, *Gorman*, no. 785 (U.S.); Ellensburg, *Whited*, no. 325 (U.S.); Lake Kachess, Kittitas Co., July 10, 1900, *H. D. Langville* (U.S.); Pend d'Oreille River, 1861, *Lyall.* BRITISH COLUMBIA: near mouth of Downie Creek, *J. M. Macoun*, no. 1129; Salt Spring Island, May 10, 1889, *J. Macoun;* Spencer Bridge, May 28, 1889, *J. M. Macoun*, transitional to var. *hispidulus;* Cameron Lake, Vancouver Isl., *Carter*, no. 220; Sproat Lake Falls, Alberni, Vancouver Isl., May 26, 1917, *Carter*, approaching var. *hispidulus;* near mouth of Downie Creek, *Shaw*, no. 1129 (U.S.); lower Frazer River, 49° N. Lat., 1859, *Lyall.* ALASKA: Attu Isl., Aug. 29, 1891, *J. M. Macoun;* Atka Isl., Aug. 26, 1873, *U. S. Coast Survey;* Iliuliuk, Unalaska, 1871–1873, *U. S. Coast Survey;* Iliuliuk, Unalaska, 1871–1872, *M. W. Harrington;* Izembek Bay, Hazen Pt., *Murie*, no. 18; Iliuliuk, Unalaska, *Jepson*, no. 317; near center of W. Boundary of McKinley National Park, *Mexia*, no. 2198 (Cal.). LOWER CALIFORNIA: San Pedro Martir, May 13, 1893, *Brandegee* (Cal.); mts., northern Lower California, *Orcutt*, no. 501 (U.S.).

The majority of authors who prefer more recent names than *Ranunculus trichophyllus* Chaix base their arguments on the assumption that Chaix's species is little else than a *nomen nudum.* Chaix's publication is as follows: "*trichophyllus* (mihi) Hall. 1162: in rivulis limpidis, Valgaud. Devoluy." It is true that Chaix himself gave no original diagnosis; but there is a definite reference to "Hall. 1162."

This, obviously, refers to Haller, Historia Stirpium Indigenarum Helvetiae Inchoata, ii. 69, n. 1162 (1768). To establish first what Haller was dealing with and at the same time to identify Chaix's species which was based upon it, it is necessary to study Haller's description, which follows:

> 1162. RANUNCULUS caule fluitante, petiolis unifloris, foliis capillaribus, laciniis divergentibus.
> *Foeniculum aquaticum, tertium* TABERNAEMONT. p. 71.
> *Ranunculus trichophyllos, aquaticus, medio luteus* COLUMN. *ecphras.* p. 315. 316. *Ranunculus aquaticus, albus, Foeniculi folio* BARRELIER. *ic.* 566. Frequentissimus in rivulis quietis, fossisque aqua plenis. A priori 1161 differt flore minori, foliis nulla quidem certa figura circumscriptis, multo tamen brevioribus, divergentibus. Flos similis: tuba maxima.
> β *Foeniculum aquaticum, cornutum* C. B. *Prodr.* p. 73. J. B. III. p. 784.
> *Ranunculus aquaticus, albus, circinnatus, tenuissime divisis foliis, floribus ex alis longis pediculis innixis* PLUKNET. p. 311. t. 55. f. 2. Circa *Nidau, Erlach, Mathod,* in fossis quietis. J. B. *Genevae,* C. B. in stagnis prope *Hiltelingen.*
> Priori proximus, folia habet a caule parum recedentia, omnino circulari circumscriptione terminata, lobis densissime congestis, imbricatis. Nolui tamen a 1162 separare.

Unfortunately for clarity's sake, Chaix did not definitely state that, although Haller's no. 1162 included a variety β, he was referring to the "α" variety. Only by inference can it be established that Chaix was referring to the latter under no. 1162, since a reference to a given plant which has one or more varieties is customarily interpreted as applying to the first element. Haller's var. β is quite obviously *Ranunculus circinatus* Sibth., because the reference to Plukenet's plate is also cited by Sibthorp[1] in the original description of *R. circinatus.* Thus, Chaix actually referred to two quite different species. However, it is possible to establish the identity of Haller's var. α, since he cites as synonymous *Ranunculus trichophyllon aquaticus medio luteus* Col. Ecphr. i. 315, t. 316, which, in turn, was listed by Linnaeus under his var. γ. Moreover, the common dissected-leaved plant of Switzerland, whence Haller's typical form of the species came, is that passing as *R. trichophyllus* Chaix, according to Schinz and Keller.[2] Furthermore, *R. trichophyllus* Chaix has been maintained by the majority of European authors as the name for this species, so that it would seem more reasonable to retain it because of its general usage than to discard it as a *nomen confusum.*

[1] Fl. Oxon. 176, n. 503 (1794).
[2] Flora Schweiz, i. 203 (1905).

In this case the sound doctrine of the International Rules of Botanical Nomenclature, "where the consequences of rules are doubtful, established custom becomes law" (Art. 5), surely supports the retention of *R. trichophyllus* in its accepted meaning.

I cannot agree, then, with Williams,[1] who states that there would not have been any obscurity as to the identity of Chaix's plant had the latter referred definitely to Haller's earlier work[2] as Linnaeus does under var. γ: Haller, though setting off a var. β which is certainly what Sibthorp later described as *Ranunculus circinatus,* included under his typical form exactly the same synonyms cited in the previous publication.

With the conception of *Ranunculus trichophyllus* established to exclude *R. Drouetii* F. Schultz and its synonyms, but to include those forms which, in North America, have dilated floating leaves, it is now necessary to determine which plants should be reduced to *R. trichophyllus.*

Ranunculus aquatilis L., var. γ[3] was set off by Linnaeus from the rest of his *R. aquatilis* as a small-flowered form bearing only immersed, dissected foliage which was not of the circinate type. There are now known at least two distinct European species which might have been intended by the Linnean var. γ; but, since the var. γ has not been made the basis of a later-published species, its exact identity does not seem to be of special importance. *R. foeniculaceus* Gilib.[4] was a name accompanied by such an incomplete diagnosis (fide Williams, p. 14 l. c.) that it might apply to *R. trichophyllus*, *R. Drouetii* or *R. circinatus*, although Rouy & Foucaud, in their Flore de France, i. 70 (1893), employed it to supersede *R. circinatus* Sibth., a procedure which had no justification because of the vagueness of Gilibert's description.

Ranunculus divaricatus Schrank,[5] described from Bavaria, is not clearly identifiable. Besides giving a brief and inconclusive diagnosis, Schrank cited as synonyms Haller's no. 1162, which was the basis of *R. trichophyllus*, and a plate of Tabernaemontanus,[6] which was a very poor illustration of something which might have been *R. Drouetii.* Williams, selecting the plate of Tabernaemontanus as the primary basis of Schrank's species, takes up *R. divaricatus* for a species distinct from *R. trichophyllus.* There seems to be no justification for

[1] F. N. Williams, Journ. Bot. xlvi. 14 (1908).
[2] Enumeratio Methodica Stirpium Helvetiae Indigenarum, i. 328, no. 17 (1742).
[3] Sp. Pl. i. 556 (1753).
[4] Fl. Lithuan. iv. 261, n. 177 (1762).
[5] Baierische Fl. ii. 104, no. 859 (1789).
[6] Neuw Kreuterb. 187 (1664).

selecting the plate of Tabernaemontanus to stand primarily for *R. divaricatus*. It shows only the habit, without any of the important diagnostic characters, but it was possibly not the same as *R. trichophyllus*. Beck von Mannagetta,[1] unlike many others in Europe, treats *R. divaricatus* (1789) as doubtfully identical with *R. circinatus* (1794), but too doubtful to displace the later and clearly identifiable *R. circinatus*. Among the important botanists who treated *R. divaricatus* as apparently identical with *R. circinnatus*, there may be mentioned Wimmer, Fl. Schlesien, 9 (1835); Koch, Syn. Fl. Germ. i. 12 (1837); Grenier & Godron, Fl. France, i. 25 (1847); Ascherson, Fl. Brandenb. i. 12 (1864); and Suringar, Ned. Kruid. Arch. ser. 2, vi. 386–423 (1895). Since, of the various species to which the name *R. divaricatus* has been applied only *R. trichophyllus* is American, it is obvious that its exact typification, should that seem important, is a European problem. Certain American botanists have, however, complicated matters by employing the name *R. divaricatus*, itself only doubtfully belonging to the strictly European *R. circinatus*, for a North American plant with circinate leaves which appears to be distinct from the Old World species. Thus, for example, Britton & Brown in the first edition of their Illustrated Flora of the Northern United States and Canada (1897) included *Batrachium divaricatum* (Schrank) Wimm. as an American plant; and many other authors have followed this interpretation.

Ranunculus flaccidus Pers. and *R. rigidus* Pers.[2] were proposed as specific segregates from *R. aquatilis* L., as treated by Leysser.[3] Persoon did not cite the synonymy for these plants, merely stating in his letter to Usteri, "Die weitläufigern Beschreibungen mit den Synonymien von diesen und von einigen anderen, mit den hiezu nöthigen Abbildungen, bekommen Sie zu einer anderen Zeit." However, referring to the *R. aquatilis* of Leysser's Flora Halensis, 136–137 (1783), it is found that Leysser treated two varieties, α and β, of the species. Variety α was based on Plukenet's plate,[4] which Sibthorp cited in the original publication of his *R. circinatus*. Variety β, of Leysser's *R. aquatilis*, was the *R. trichophyllus aquaticus medio luteus* Colonna, Ecphr. i. 315. t. 316, which formed the basis of Haller's no. 1162, var. α, and therefore of Chaix's *R. trichophyllus*. Persoon did not actually state with which variety of Leysser's *R. aquatilis* his

[1] Fl. v. Nied.-Österreich, i. 414 (1890).
[2] Pers. in Usteri, Ann. d. Bot. xiv. 38–39 (1795).
[3] Fl. Halensis, 136–137 (1783).
[4] Pluk. Op. i. Phytograph. tab. 55, f. 2 (1691).

R. flaccidus and *R. rigidus* belong. From Persoon's description of *R. rigidus*, "foliis omnibus incisis: laciniis rigidis utrinque compressis, reniformiter divergentibus.", it is apparent that it corresponded to Leysser's *R. aquatilis* var. α. *R. flaccidus*, consequently, was equivalent to Leysser's *R. aquatilis* var. β. Turning to Persoon's Synopsis Plantarum, 105 (1807), it is found that he there included *R. capillaceus* and *R. rigidus*, but no *R. flaccidus*. The description of *R. flaccidus* (1795) and the later *R. capillaceus* (1800) correspond very closely, so that it is reasonable to assume that Persoon intended *R. capillaceus* to supplant *R. flaccidus* as the name for his plant. Thus it is apparent that *R. flaccidus* (as well as the later *R. capillaceus*) is synonymous with *R. trichophyllus*, since Persoon's species was based on the variety β of *R. aquatilis* L., as treated by Leysser, which, in turn, was founded upon *R. trichophyllus aquaticus medio luteus* of Colonna, the basis of Haller's no. 1162 (var. α), and therefore Chaix's *R. trichophyllus*. *R. rigidus* (1795), however, is plainly synonymous with the earlier *R. circinatus* (1794), because of the citation of Plukenet's plate in the descriptions of both plants.

Ranunculus flaccidus Pers. was employed by Asa Gray in the Synoptical Flora of North America, as a variety under his *R. aquatilis* L. *R. aquatilis*, var. *flaccidus* Gray was the common dissected-leaved plant of New England, characterized by its long and few-segmented foliage. Gray's plant was probably identical with my *R. trichophyllus*, var. *calvescens*, which is found chiefly in New England.

Ranunculus cespitosus Thuill. (l. c.), appears, from Thuillier's description, to be a mud-form of some dissected-leaved species, the identity of which is not certain. According to Hiern, *R. cespitosus* might belong to *R. trichophyllus*, *R. Drouetii*, *R. circinatus*, or *R. fluitans*. DeCandolle, however, in his Systema, made *Ranunculus cespitosus* Thuill. a variety (β *caespitosus*) of his *R. pantothrix*. From the description of this plant and from the citation of such synonyms as *R. aquaticus albus circinnatis tenuissimé divisis foliis* Pluk. Alm. 311, t. 55, f. 2, *R.* no. 1162, var. β Haller and *R. rigidus* Pers. (all of which are synonymous with *R. circinatus* Sibth.), it is clear that DeCandolle intended his *R. pantothrix*, β *caespitosus* for the species now generally interpreted in Europe as *R. circinatus* Sibth. In the later Prodromus treatment, DeCandolle included all the species of the group, save *R. hederaceus* and *R. tripartitus*, under *R. aquatilis* L. Thus *R. pantothrix*, β *caespitosus* of the Systema becomes *R. aquatilis*, γ *caespitosus* of the Prodromus arrangement. Although the

synonymy of *R. aquatilis*, γ *caespitosus* is somewhat reduced, it is plain from the cited synonyms and the description, that DeCandolle's plant was, also, the same as Sibthorp's *R. circinatus.* The Prodromus treatment is important to North American botanists, since several early students of our floras closely followed DeCandolle. Thus, Torrey & Gray, in the Flora of North America, i. 16 (1838), which was, to use Gray's own words, "hastily compiled," followed the Prodromus arrangement very closely, so that DeCandolle's *R. aquatilis*, γ *caespitosus* (the plant now passing in Europe as *R. circinatus* Sibth.) was included as a member of our flora. Later (1895), Asa Gray,[1] largely drawing upon the conclusions of Hiern,[2] treated *R. aquatilis*, var. *caespitosus* DC. as a "dwarf and condensed form" (under *R. aquatilis* L., and not under *R. circinatus* Sibth. with which DeCandolle's *R. aquatilis*, γ *caespitosus* was identical). Piper,[3] too, has taken up DeCandolle's *R. aquatilis*, γ *caespitosus*, apparently in the same sense as Gray. Just how Hiern reached his conclusions as to the nature of Thuillier's *R. cespitosus* I am not certain. It is evident, however, that at least DeCandolle's *R. aquatilis*, γ *caespitosus* was actually the species now passing as *R. circinatus* Sibth., a strictly European plant.

Thuillier also described a *Ranunculus capillaceus* which appears to have little significance, since it was founded on Haller's no. 1162, the basis for *R. trichophyllus* Chaix. Several years later, in his Systema (1817), DeCandolle took up *R. capillaceus* Thuill. as a variety α of his *R. pantothrix.* DeCandolle evidently considered *R. pantothrix*, α *capillaceus* the same as *R. trichophyllus*, since included in the synonymy of the former was Haller's no. 1162 (var. α), as well as *R. trichophyllus* itself. In the Prodromus arrangement, DeCandolle transferred *R. pantothrix*, α *capillaceus* of the Systema treatment to *R. aquatilis*, α *capillaceus*, which is also clearly synonymous with *R. trichophyllus.*

In the seventh edition of Gray's Manual, 394 (1908), DeCandolle's *Ranunculus aquatilis*, β *capillaceus* was taken up instead of *R. trichophyllus* for the common dissected-leaved plant of the northeastern United States. It therefore included typical *R. trichophyllus* and var. *calvescens.*

Ranunculus paucistamineus Tausch[4] was originally described from a Bohemian plant. Although I have not examined the type, I have

[1] Synop. Fl. No. Am. i. 21 (1895).
[2] Journ. Bot. ix. 100 (1871)
[3] Fl. Wash., Cont. U. S. Nat'l. Herb. xi. 270 (1906).
[4] Flora, xvii. 525 (1834).

been fortunate enough to be able to study an authentic Bohemian specimen of *R. paucistamineus*, named by J. Freyn,[1] which is in the Gray Herbarium. The plant differs at once from *R. trichophyllus* in the elongate fruiting peduncles, the many small achenes crowded upon an elongate (3 mm.) receptacle, and the large, flaring, stipular sheaths. The fruiting characters would hardly place the plant with *R. aquatilis* L., as Freyn maintains, since they are of the *R. circinatus*, *R. Baudotii*, and *R. marinus* circle of affinity. All of these species have elongate fruiting peduncles, many rather small achenes (± 1.25 mm.), a long receptacle (± 3 mm.), and large, well developed stipular sheaths, unlike typical *R. trichophyllus*. I do not propose to go further, at this time, into the relations of these European plants. Suffice it to point out that probably *R. paucistamineus* is not exactly identical with *R. trichophyllus*, as Freyn himself has stated.[2]

It is therefore doubtful if the course followed by Gelert,[3] the Danish monographer, in regarding *R. paucistamineus* as not only including *R. trichophyllus*, but also *R. diversifolius* Schrank, was justified. Gelert is followed, however, by Lindman in his Svensk. Fanerogamflora, 264–265 (1918). Somewhat different is the view held by Pearsall, who maintains that *R. paucistamineus* is an aggregate species of wide range, including *R. Drouetii*, *R. trichophyllus*, and "even larger forms of our (*R. heterophyllus*) var. *submersus* so long as the flowers are not too large." For the present *R. paucistamineus* as described by Tausch and distributed by Freyn in his Flora Exssic. Austro-Hung., will be regarded as something quite different from typical *R. trichophyllus;* but, in the sense of Hiern, or Pearsall, *R. paucistamineus* is in part referable to *R. trichophyllus*. Until the type can be examined, if it still exists, I do not feel that *R. paucistamineus* can be finally referred to *R. trichophyllus*.

Ranunculus aquatilis L., var. *Drouetii* (Schultz) Lawson, as treated by Lawson,[4] was probably a slender form of our typical *R. trichophyllus* (or else the northern *R. trichophyllus* var. *eradicatus*). I have not been able to differentiate clearly among our plants *R. Drouetii* of Europe. The common dissected-leaved plant of the Cascade Mountains, British Columbia, and the Aleutian Islands is typical *R. trichophyllus*, though its northern variety *eradicatus* is also found in Alaska.

Ranunculus aquatilis L., var. *brachypus* Hook & Arn.[5] was described

[1] Fl. Exssic. Aust.-Hung., J. Freyn no. 95.
[2] Freyn, J., Beil. Bot. Centralbl. vi. no. 26: 1 (1881).
[3] Bot. Tidsskr. xix. 26–29 (1894).
[4] Trans. Roy. Soc. Can. ii. sect. iv, 45–46 (1884).
[5] Bot. Beech. Voy. pt. 7; California-Suppl. 316 (1840).

from a Californian plant which had peduncles invariably shorter (less than one inch long) than the leaves, which, in turn, were divaricate. After examining many Californian *Batrachia*, I can find no basis for maintaining this state as a variety.

Batrachium Bakeri[1] and *B. pedunculare*[2] of Greene appear to be two atypical forms of the common *R. trichophyllus;* the fundamental floral and fruiting characters of the plants are nearly identical. Moreover, various plants of *R. trichophyllus* can be recognized which show foliage transitional to *B. Bakeri* and *B. pedunculare*.

Dr. Pennell and Dr. Merrill have kindly lent me the type material of *Ranunculus Porteri* Britton.[3] An examination of the specimen in the Herbarium of the New York Botanical Garden showed a plant with unique, narrowly wedge-shaped foliage unlike any other *Batrachium*. Upon studying the other material, from the Herbarium of the Philadelphia Academy of Sciences, I found that of the three fragments there preserved the one bearing a flower bud had foliage of the normal, long, filiform type usually associated with *R. trichophyllus*. I am inclined to believe, then, in the absence of other plants bearing the peculiar foliage and because at least one fragment bears the nearly normal foliage of typical *R. trichophyllus*, that *R. Porteri* is an aberrant form of *R. trichophyllus*.

In his Manual of the Flowering Plants of California, Jepson (l. c.) reduces *Batrachium Bakeri* and *B. pedunculare* of Greene to varieties under his *Ranunculus aquatilis*. This arrangement was a step in the right direction, though it is doubtful if Greene's so-called "species" are anything more than local forms.

Finally, mention should be made of certain plants from southern California[4] which appear to be referable to *Ranunculus Rionii* Lagger, a species chiefly found in Europe, though certain plants in the Gray Herbarium from eastern Asia also seem referable to it. *R. Rionii* is characterized by small flowers, short-petioled flaccid leaves, and many very small achenes (± 1 mm. long). Whether the Californian plants which I am tentatively referring to this species are introduced or not, I am in no position to decide. Further studies, especially in the field, are necessary to determine this point. For the present, then, it will suffice merely to show that plants have been recognized in North

[1] Leaflets Bot. Obs. & Crit. i. 95 (1904).
[2] Leaflets Bot. Obs. & Crit. loc. cit.
[3] Bull. Torr. Bot. Club, xvii. 310 (1890).
[4] *California:* small branch of Chino Creek, 5 miles northwest of Corona, Riverside Co., *Munz*, no. 5022 (Cal.); sluggish brook east of Puddingstone Canyon, San Dimas, Los Angeles Co., *Munz*, no. 5601 (Cal.); *Lemmon* Herb., Cal. no. 338,356.

America which appear to be referable to the chiefly European *R. Rionii,* which, in turn, is closely related to *R. trichophyllus.*

4. R. TRICHOPHYLLUS Chaix, var. **hispidulus** (E. R. Drew), comb. nov. Plants with emersed, dilated floating leaves; their lobes 3–5, acute or obtuse-rounded at the tips and variously subdivided: floral and fruiting characters as in typical *R. trichophyllus.*—*R. hydrocharis* Spenn., forma *trichophyllus* (Chaix) Hiern, Journ. Bot. ix. 101 (1871), in part. *R. aquatilis* L., "form *heterophyllus*" Gray, Rev. No. Am. Ranunc., Proc. Am. Acad. xxi. 363 (1886). *R. aquatilis* L., var. *hispidulus* E. R. Drew, Bull. Torr. Bot. Club, xvi. 150 (1889). *R. aquatilis* L., var. *heterophyllus* DC. *sensu* Gray, Synop. Fl. i. 21 (1895), non DC. *R. Grayanus* Freyn, Deutsch. Bot. Monatschr. viii. 179–180 (1890). *B. aquatile* Dumortier *sensu* Howell, Fl. Nw. Am. i. 13 (1897), non Dum. *B. aquatile* Wimm. *sensu* K. C. Davis, No. Am. Ranunculi, Minn. Bot. Studies ser. ii: pt. 3. 461 (1900), non Wimm. *R. aquatilis* L., var. *hispidulus* (E. R. Drew) Jepson, Man. Fl. Pl. Calif. 391 (1925). *R. aquatilis* L. *sensu* Jepson, loc. cit., in part, non L.—Plants chiefly of the West, ranging from California to Alaska, east to western Montana, Idaho, and northern Utah. The following plants are representative: MONTANA: Columbia Falls, *R. S. Williams,* no. 991 (U.S.). IDAHO: near Harrison, valley of Coeur d'Alene River, Kootenai Co., *Sandberg, MacDougall,* & *Heller,* no. 645; forks of the St. Mary's River, *Leiberg,* no. 1169, at least as to the plant with dilated leaves. UTAH: near West Fork of Bear River, Summit Co., *E. B. & L. B. Payson,* no. 4848, distributed as *R. Grayanus* Freyn. CALIFORNIA: Prattville, alt. 4,500 ft., July 5, 1897, *M. E. Jones;* Plumas Co., 1873, *Mrs. M. E. P. Ames, Mrs. R. M. Austin,* sheet no. 135,580 (Cal.); eight miles north of Folsom, *Ramaley,* no. 11309 (Cal.); near summit of ridge between Van Duzen and Mad Rivers, on Dinsmore's Ranch, *J. P. Tracey,* no. 4276 (Cal.), a form somewhat resembling a small *R. peltatus;* floating on water in meadows, Russian River, *Bolander,* no. 3869 (U.S.), distributed as *R. hederaceus* L.; Round Valley, Mendocino Co., 1898, *Westerman* (Cal.); Mad River, near Jarnigans, July 1, 1890, *W. W. Price* (Cal.); Hydesville, Humboldt Co., June 19, 1893, *Blankinship* (Cal.); pond by railroad near Ione, *Greene,* journey of 1889 (U.S.); one mile west of Keystone, Tuolumne Co., *Abrams,* no. 10063 (U.S.); shallow water, Cuyamaca Lake, *Munz* & *Harwood,* no. 7204. OREGON: Oregon, *E. Hall,* no. 4 and 4a; in ditches, Portland, 1881, *Henderson;* pool by roadside, Salem, *J. C. Nelson,* no. 1070; Guano Ranch, Lake Co., *Coville,* no. 608 (U.S.); in ditches, Woodburn, *Howell,* no. 1779 (U.S.); the Dalles, *Brandegee,* no. 606 (U.S.); in a pond on Walker's Creek, Jackson Co., *Applegate,* no. 2333 (U.S.); Forest Grove, May, 1898, *Kirkwood* (U.S.); brooks near McMinville, *Mrs. R. W. Summers,* no. 5 (Cal.). WASHINGTON: on mud and in shallow water, Falcon Valley, Klickitat Co., *Suksdorf,* no. 10074; White Salmon, *Suksdorf,* no. 1879, a form close to *R. heterophyllus* Web.; in slow streams, Fal-

con Valley, May 28, 1892, *Suksdorf* (U.S.), transitional to *R. trichophyllus;* near Rock Ck., Spokane Co., *Sandberg* & *Leiberg*, no. 90 (Cal.); Walla Walla, *Brandegee*, no. 606 (Cal.); Camano Is., June 1, 1895, *N. S. Gardner* (Cal.); Aghut, Chehalis Co., *Lamb.* no. 1261 (U.S.). BRITISH COLUMBIA: below Sproat Lake Falls, Alberni, July 1916, *Carter*, a form close to the European *R. lutarius* Bouvet; Victoria, May 18, 1895, *Pineo* (Cal.). ALASKA: Nagai Isl., Shumagins, Aug. 2, 1872, *Harrington;* Nagai Isl., Shumagins, Sept. 18, 1892, *Jas. M. Macoun;* neither of the last two seems to be exactly var. *hispidulus*, but, in the absence of clear diagnostic characters, it is perhaps better temporarily to place them here.

Though obviously closely related to certain European plants, this variety does not appear to be identical with any of them. It has most frequently been identified with *R. heterophyllus* Web. of the Old World.[1] Accordingly I have made an intensive taxonomical study, aided by the abundant material at the Kew Herbarium, on the relation of these two forms. In general, *R. heterophyllus* is much larger and coarser than the usual form of our plant. Accompanying this greater size is also a greater number of parts, as frequently in the petals and the stamens. Moreover, the average diameter of the flowers of *R. heterophyllus* is close to 2 cm., whereas the average for our plant is about 0.8 cm. However, only when many specimens are examined does this difference become clear-cut, since small forms of *R. heterophyllus* appear almost inseparable from the larger examples of our *R. trichophyllus*, var. *hispidulus*. Furthermore, the same difficulty arises with smaller specimens of *R. peltatus*. Furthermore, these European dilated-leaved species of the Old World *R. aquatilis* (s. s.) group, *R. heterophyllus* and *R. peltatus*, are there apparently easily separable from *R. trichophyllus*, which is regarded by such careful and authoritative students as Felix[2] and Pearsall as *never*—and they emphatically insist on this word *never*—developing dilated floating leaves. Except for its somewhat dilated leaves, however, our plant is very close to *R. trichophyllus*, and has been regarded as a form of it by Hiern[3] and by Freyn.[4] The closely related *R. radians*,

[1] From the North American material of *Batrachium* in the U. S. National Herbarium, Gray Herbarium, and Herbarium of the University of California, it appears that only one specimen can properly be called a member of the Old World *R. aquatilis* (s. s.) complex. This plant, collected in 1887 at South Hadley, Massachusetts, by A. Clark (U. S. no. 275,313), appears to be referable to the European *R. peltatus* Schrank. Inasmuch as no other specimens of this plant are to be found in the Herbaria cited above, which I have examined, it is probable that this plant of *R. peltatus* is a casual introduction into this country from Europe.

[2] Bull. Soc. Bot. France lx. 260 (1913).

[3] Journ. Bot. ix. 101 (1871).

[4] Deut. Bot. Monatschr. viii. 180 (1890).

R. Godronii and *R. Petiveri* of the European *R. trichophyllus*-plexus certainly develop dilated floating leaves, although typical *R. trichophyllus* itself does not. These species, though closely allied to *R. trichophyllus*, are apparently quite distinct one from the other. Such is not the case with our dilated-leaved plant which in its fundamental fruiting and floral structures seems inseparable from the *R. trichophyllus* of North America. The only consistent feature about it is its geographic distribution: apparently it is never found east of the Rocky Mountain states. It is doubtless better, then, to treat it as a geographic variety.

The first mention of our plant is found in Hiern's account of the "Forms and Distribution of Batrachium" (l. c.). Hiern. simply stated that a form of his *Ranunculus hydrocharis* Spenn., forma *trichophyllus* with floating leaves occurs in California; but he gave this form no name. It seems very significant to me that Hiern, who was perhaps the best informed student of *Batrachia* from a world-wide point of view, should conclude that it was a form of *R. trichophyllus* and not a member of the *R. aquatilis* group (s. s.). Gray, in his revision of the North American *Ranunculi* (l. c.), merely stated that the form "heterophyllus" (the type of Linnaeus's *R. aquatilis*) was distributed from British America and North Alaska to California. He regarded it simply as a member of the *R. aquatilis* complex. A similar interpretation was maintained in the Synoptical Flora. The character upon which *Ranunculus aquatilis* L., var. *hispidulus* E. R. Drew was based, the pubescent under surfaces of the floating leaves and petioles, seems unimportant in view of the fact that such is the condition of normal specimens of the European *R. heterophyllus, R. peltatus,* and other dilated-leaved species. Although this variety of Drew's was based upon a weak character, the name which he assigned to it must be taken up, since it is the first one clearly and exclusively pertaining to our plant.

Ranunculus Grayanus Freyn is doubtless our western heterophyllous form of *R. trichophyllus* since it coincides with the latter in taxonomical characters and geographical distribution.[1] It is the correct name for the plant, if treated as a species, as is done by Rydberg and by Tidestrom.

[1] Freyn's opinion of the relation of *R. Grayanus* is significant. He writes in part, "*R. Grayanus* verhält sich zu *R. Godronii* Gren. genau so, wie der ägyptische *R. Aschersonii* m. zu dem Formenkreise des *R. Petiveri homophyllus* und deshalb habe ich die amerikanische Form neu benannt; sie gehört dem engeren Formenkreise des *R. paucistamineus* Tsch. an, nicht jenem des *R. aquatilis* L. p. p., wie ich dieselben in A. Kern. Sched. ad. flor. Austriac. v (1888) p. 38 skizziert habe."

Dr. Porsild,[1] in his studies on the West Greenland flora, has reported a *Batrachium* with dilated-floating leaves which he refers to *R. divaricatus* Schrank. Lacking material of Porsild's plant at the present time, it will be extremely interesting to determine at some future date whether this plant is one of the many European forms or if it is more closely related to our *R. trichophyllus*, var. *hispidulus*.

5. R. TRICHOPHYLLUS Chaix, var. **calvescens**, var. nov. (TAB. 383, FIGS. 8, 9). Var. *typico* similis; receptaculo glabro vel subglabro, acheniis maturis quam in var. *typico* longioribus (plerumque circa 1.5–1.75 mm., in var. *typico* 1–1.5 mm.) laevioribus semperque glabris.—The common form of New Brunswick and New England, south to Pennsylvania and west to Michigan. The following are typical: NEW BRUNSWICK: Bass River, July 27, 1875, *Fowler* (U.S.). NOVA SCOTIA: Shinimikas River, Northport, Cumberland Co., *Fassett*, no. 2250. MAINE: common in gravelly-bottomed streams, Dover, Sept. 1, 1894, *Fernald*, and same region, *Fernald* no. 240; dead water in the river, Milo, Sept. 2, 1897, *Fernald;* mouth of Penjajawock Brook, Bangor, *Fernald*, no. 2693; Dyer Brook, Island Falls, Aug. 28, 1897, *Fernald;* Woodstock, July, 1887, *Parlin;* Pennamaquan River, Pembroke, *Fernald*, no. 1776; clayey brook, Farmington, July 18, 1903, *Knowlton;* Sunkhaze Stream, Milford, July 23, 1892, *Fernald;* Cobossee Contee Lake, Winthrop, Aug. 1898, *T. J. Battey;* sluggish streams, Wells, June 16, 1894, *Parlin;* Hermon Pond, *Knight*, no. 4517; Sebasticook stream, Newport, *C. D. Harvey*, no. 15 (U.S.); shallow water of White's Brook, Seven Islands, Township xiii, Ranges 14 and 15, Aroostook Co., *St. John* & *Nichols*, no. 2292 (U.S.). NEW HAMPSHIRE: Bear Camp River, West Ossipee, Sept. 6, 1855, *W. Boott;* "Weare's Mill," Seabrook, *A. A. Eaton*, no. 33; East Jaffrey, July 6, 1889, *W. Deane* (U.S.). VERMONT: near Isle La Motte, Lake Champlain, July 19, 1878, *Pringle;* West Rutland, Aug. 25, 1895, *Eggleston;* totally submerged, south of Knights Island, Lake Champlain, July 21, 1899, *Brainerd*. MASSACHUSETTS: Cram's River, Danvers, July 2, 1885, *J. H. Sears* (TYPE in Gray Herb.), June 10, 1886 and July 5, 1896, *Sears;* brook in Walnut Grove, Danvers, June 10, 1886, *Sears;* brook, near Harrington's, Concord, July 12, 1887, *E. S. Hoar;* Blue Hill Reserv., Randolph, June 22, 1895, *J. R. Churchhill;* Purgatory Brook, Norwood, June 17, 1895, *G. G. Kennedy;* Martin's Brook, North Reading, *Pease*, no. 2013; Hunt Place Brook, Randolph, Nov. 11, 1894, *G. G. Kennedy* (sterile); near Green Lodge, Dedham, *C. E. Faxon;* stream flowing into Ward Pond, Becket, July 11, 1909, *Hoffman;* slow stream, Richmond, June 24, 1901, *Hoffman;* West Boxford, *C. N. S. Horner;* stagnant pool, West Quincy, Sept. 3, 1894, *Rich;* brook in meadow, Sharon, July 12, 1896, *Rich;* cold brook, Dover, Sept. 2, 1889, *G. G. Kennedy;* Melrose, July 6, 1876, *Morong;* Mill Pond, North Saugus, *F. S. Collins*, no. 730; Southamp-

[1] Meddel. om Grönl. lviii. 77 (1926).

ton, 1892, *Chapman*, at least as to specimens on the right of the sheet (U.S.); Amherst, Aug. 2, 1881, *B. P. Clark* (B.U.); in brook, West Stoughton, *S. F. Blake*, no. 3682 (U.S.), transitional to var. *typicus*. RHODE ISLAND: Rush Brook Swamp, North Scituate, May 30, 1911, *Floyd* & *Preston;* Smithfield, *Thurber*. CONNECTICUT: Glastonbury, Aug. 15, 1903, *Driggs;* Beaver Brook, Milford, May 28, 1899, *E. H. Eames;* in running streams, Southington, *L. Andrews*, no. 766; Mianus River, Stamford, *Eames* & *Godfrey*, no. 8222; New Haven, *D. C. Eaton;* Somers, *Pease*, no. 583; in brooks, common, Southington, June 30, 1896, *Bissell;* small brook, near Dragon's Den, Franklin, June 28, 1905, *Graves;* brooks, common, Southington, *Bissell*, no. 47; Whetstone Brook, Killingly, July 2, 1903, *Knowlton;* brook, Warren, July 18, 1919, *Nichols;* Trout Creek Bridge, Franklin, July 10, 1906, *Woodward;* Bridgeport, June 23, 1885, *A. L. Winton, Jr.* (U.S.); shallow, slow-flowing water of stream, Redding, *Weatherby*, no. 5676 (U.S.). NEW YORK: cold brook near Cohasset on Fourth Lake, Herkimer Co., *House*, no. 6697, a form with achene unusually long-beaked. PENNSYLVANIA: frequent, Chester Co., June, 1858–1864, *S. P. Sharples*, sterile. MICHIGAN: Keweenaw Co., *Farwell*, no. 134.

Although var. *calvescens* is more typical of eastern North America, plants with glabrous achenes and nearly naked receptacles are occasionally found in the West. Usually, however, these western plants have definitely smaller achenes and smaller flowers than var. *calvescens*. Moreover, at the northern limits of its range in New Brunswick and northern Maine, var. *calvescens* makes transitions to typical *R. trichophyllus;* plants from northern Maine will often have few to several hairs on the receptacle, but they never show the densely pubescent condition of the typical form of the species.

6. R. TRICHOPHYLLUS Chaix, var. **eradicatus** (Laestadius), comb. nov. (FIG. 5). Plants with very slender, weak stems usually with many adventitious roots: leaves short, flaccid, filiformly dissected, petioled, with narrow, mostly adnate, hairy or nearly glabrous stipular sheaths: flowers small, 0.7–0.8 cm. in diameter: petals 3–6 (av. 5)-veined: stamens 5–10, varying in length according to their age: carpels 8–20 (usually 12–16), usually hairy when immature; achenes 1–1.5 mm. long, hairy or not, usually quite smooth, with a very short inconspicuous beak: receptacle 0.75–1.5 (av. 1) mm. long, variously shaped, almost invariably long-hairy.—*R. aquatilis* L., var. *eradicatus* Laestadius, N. Act. Reg. Soc. Scient. Ups. xi. 242 (1839). *Batrachium eradicatum* Fries, Bot. Notis. 114 (1843), name only. *B. confervoides* Fries, Bot. Notis. 121 (1845). *R. confervoides* Fries, Summa Veg. Scand. i. 139 (1846). *R. paucistamineus* Tausch, var. *borealis* Beurl. Bot. Notis. 156 (1852). *R. lutulentus* Song. & Perr. in Billot. Annot. Fl. Fr. et Allem. 181 (1859[1]). *B. admixtum* Nyl.

[1] See discussion.

& Saell. Herb. Mus. Fenn. 35 (1859), acc. to F. N. Williams.[1] *R. aquatilis* L., γ. *saganensis* Regel et Radde, Regel, Bull. Soc. Nat. Mosc. xxxiv. pt. 2: 39 (1861). *R. hydrocharis* Spenn., forma *confervoides* (Fries) Hiern, Journ. Bot. ix. 102 (1871). *R. aquatilis* L., var. *confervoides* (Fries) Lawson, Rev. Can. Ranunc., Trans. Roy. Soc. Can. ii: sect. iv. 45 (1884). *R. trichophyllus* Chaix, var. *demersus* N. E. Brown, Eng. Bot. Suppl. 12 (1892), ed. 3, acc. to Williams. *R. divaricatus* Schrank, var. *eradicatus* (Laestad.) Williams, Journ. Bot. xlvi. 21 (1908). *R. flaccidus* Pers., var. *confervoides* (Fries) Hegi, Illus. Fl. Mittel-Europ. iii. 584, fig. 708 k (1912).—Greenland, Labrador, Newfoundland, Quebec (Gaspé Peninsula, anticosti and James Bay); northern Wyoming; Alaska; northern Europe. The following specimens are referred here. Greenland: Egedesmindes, lat. 67° 57′ Syddistrikt, July 30, 1924, *A. E. Porsild;* Godhavn, lat. 69° 14′, Sept. 10–20, 1920, *A. E. Porsild;* Queqertarssuag, Nûgâtsiaq, lat. 71° 33′, July 16, 1929, *M. P. & R. T. Porsild;* Ingnerit Fjord, Magdläq, lat. 71° 7′, July 12–13, 1929, *M. P. & R. T. Porsild;* Tringa Pond, North Star Bay, lat. 76° 30′, *Ekblaw,* nos. 341, 342 and 343. Labrador: pool in rocks, Near Island, Seven Islands Bay, Kangalaksiorvik, *Abbe,* no. 325; gneiss plain, Blanc Sablon, *Fernald & Wiegand,* no. 3406. Newfoundland: open peat bogs among the Silurian hills back of Birchy Cove (Curling), *Fernald & Wiegand,* no. 3405; shallow pools, Eddie's Cove, Straits of Belle Isle, *Fernald, Wiegand, & Long,* no. 28,245; pond-holes and pools, Sacred Island, Straits of Belle Isle, *Wiegand, Gilbert & Hotchkiss,* no. 28,247; shallow pools in swampy clearings and thickets, Bard Harbor, St. John Bay, *Fernald & Long,* no. 28,246; peaty depressions in tundra, Schooner (or Brandy) Island, Pistolet Bay, *Pease & Long,* no. 28,244; shallow pools near Harry's River, *Fernald & Wiegand,* no. 3408, approaching *R. trichophyllus,* var. *typicus;* Quiddy Viddy Lake, Aug. 2, 1894, *Robinson & Schrenk;* Exploits River, near mouth of Badger Brook, Aug. 13, 1894, *Robinson & Schrenk.* Quebec: stagnant water, Cape Chudleigh (Cape Chidley), Hudson Strait, Aug. 5, 1884, *R. Bell;* in shallow water, on granite rocks, Lac Perrée, Tabletop Mts., Gaspé Co., *Fernald, Dodge & Smith,* no. 25,755; alpine lake, Tabletop Mts., Gaspé Co., *Fernald & Collins,* no. 570; estuaire de la Rivière York, *Victorin, Rolland, Brunel & Rousseau,* no. 17,353; Rivière la Loutre, Anticosti, *Victorin & Rolland,* no. 25,444, doubtful. Wyoming: Swan Lake Flat, Yellowstone Park, *E. C. Smith,* no. 207 (U.S.), and *E. A. Mearns,* no. 2434 (U.S.), both doubtful. Alaska: St. Paul Island, *J. M. Macoun,* no. 89,578.

The original description by Laestadius,[2] which was extremely detailed, is significant in evaluating the merit of subsequent treatments of this variety.[3]

[1] See discussion.

[2] N. Acta. Reg. Soc. Scient. Ups. xi. 242 (1839).

[3] "2) *a.* subaquaneus, caule bi 1. 3-pollicari, filiformi; floribus minutissimis, ante explicationem vix semine cannabis majoribus; foliis non proprie capillaribus, sed

It is quite evident from Laestadius's remarks that he believed the filiform and diminutive habit of the plants to be due to ice-action in pulling up the roots so that the new growth arose from the fragments of the old. In other words, he regarded var. *eradicatus* as simply a variation, brought about by the rigors of a subarctic climate, of the usual dissected-leaved European *R. aquatilis*.

It was subsequently pointed out by Fries[1] that Laestadius was dealing with an abnormal state of the plant described by the former as *Batrachium confervoides*. In part Fries writes: "Collatis numerosis et perfectis speciminibus e varietatum numero excludendus omnino est *Ranunc. aquatilis eradicatus* Laest., qui abnormem quidem statum sistit (quare nomen varietatis ad speciem trahere non licet), sed ad speciem carpellis, β *tripartiti* Reich. Ic. f. 4574 figura exactissime respondentibus, et receptaculo cylindrico-conico diversissimam pertinet."

Thus Fries regarded the plant as a close relative of *R. tripartitus* rather than of *R. aquatilis* L. He was doubtless correct, since the fruit of *R. tripartitus* as depicted in the plate[2] referred to, which closely matched that of *R. confervoides*, is certainly not to be confused with that of *R. aquatilis* L. (s. s.), in which the achenes are larger, more pointed and frequently bear hairs. Whether or not the plant of Laestadius was abnormal, one can hardly say without examination of the original specimen which Fries had evidently studied. It is noteworthy in this connection, however, that the great majority of authentically named specimens of *R. confervoides* possess adventitious roots at many of the nodes, which would indicate that to survive the severe climatic conditions to which they are subjected, the plants necessarily develop these organs, especially when broken off from their weak, primary fibrous roots. Moreover, many specimens exhibit deformed stems so that it is undoubtedly true that ice-action and stranding have an effect on the habit of the next year's growth. Thus perhaps the plant of Laestadius was not so very abnormal, but rather was more severely damaged than usual by ice-activity.

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abbreviatis; radice filiformi, fibrosa. Hab. in stagnis vadosis ex. gr. Karavuopio et Saxajerfvi ad Karesuando Lappon. Tornensis. Caespitose crescit in fundo, quo etiam floret sub aqua, interstitio 3-pedali ex summitate plantae ad superficiem aquae. Aeque memorabilis et omnino constans varietas ac *Nymphaea pumila*, et pari modo orta. Glacies enim radices *Ranunculi aquatilis* funditus evellit; sed reliquiae i. e. *radiculae*, ipsae graciles, gracillimam edunt plantam; quae tali modo diminuta, praecox quoque facta est: Nam *Ranunculus aquatilis vulgaris* nondum explicavit flore, hujus fructibus jam maturis. *Ran. aquatilis* α, saepius in alto et in aqua manante nascitur; unde et serius floret, et folia valde elongata et eximie capillacea habet."

[1] Bot. Notis. 121 (1845).

[2] Reichenb. l. c.

At this point it is pertinent to discuss the characters upon which *Batrachium confervoides* Fries[1] was based, with a view to more clearly establishing its relation to the other *Batrachia*. The habital characters appear to be important, since the filiform, rather short leaf-segments and weak, slender stem are superficially quite different from those of normal specimens of the other European *Batrachia*. Few groups of plants, however, are as polymorphic in their habit, foliage, etc., as the *Batrachia;* and *R. confervoides* of all the aquatic, white-flowered *Ranunculi* has the most severe of environmental conditions. One would, therefore, expect plants of the same species under these conditions to be habitally different from others of their kind growing farther south. Little emphasis can be placed on such characters as specific distinctions unless they are associated with more fundamental differences. Fries's diagnosis is as follows: "Stamina 10–15, ovariorum capitula longiora. Receptaculum conico-cylindricum, longe hirsutum, cum carpellis globosum. Carpella obovato-turbinata, fere aequalia, extus acute carinata, omnino mutica, apice rotundato-obtuso, sursum primo hispidula, demum calva: diu laevia persistentia, ceterisque demum multo obsoletius transverse rugosa." Checking these characters with authentically named European material[2] I find that this diagnosis is essentially adequate. The carpels, however, are not always "sursum primo hispidulo" and glabrous at maturity. Careful study shows that the immature carpels are glabrous as often as they are hispidulous; and the mature achenes are pubescent and glabrous in nearly the same ratio. Consequently, little diagnostic importance can be attached to the presence or absence of hairs either on the immature or mature carpels.

The characters of *R. confervoides* which appear to be the more significant are as follows: first, the usually short leaves, and filiform stem: second, the many adventitious roots; and, third, the more or less smooth mature achenes. It seems entirely possible that *R. confervoides* is nothing but the northern form of the ordinary *R. trichophyllus*, the fundamental characters of which, with the possible exception of the smooth achenes, remain practically unobscured even though habital changes have altered the normal appearance. The smooth achenes seem to be the most significant character, but further

[1] Bot. Notis. l. c.

[2] a. In lacu Schwarzee dicto prope Zermatt, Helvetia, alt. 2500 M., *F. Schultz*, herb. norm., nov. ser. cent. 11, no. 1009.

b. Uleaborg; Finlandia, *Dr. W. Nylander*, Jun.

c. E. Lapponia Tornensis, *L. L. Laestadius*.

study of European material is needed to decide as to their constancy and diagnostic value. For the present *R. confervoides* is regarded in this paper as a northern variety, unfortunately not too well marked, of the ordinary European and North American *R. trichophyllus*.

Ranunculus aquatilis, var. *eradicatus* of Laestadius appears to be the earliest name applicable to our plant, even though Fries states that it was applied to a somewhat abnormal form. It does not seem to me, however, that Laestadius' name can be disregarded on the basis of the International Rules of Nomenclature, Art. 51 (no. 3), which states that a name can be rejected if based upon a monstrosity, since, from the description, it is hardly in the latter class. If, however, it should be shown from a first-hand examination of Laestadius' plant, that it may properly be considered a monstrosity, which seems unlikely, the name would have to be rejected.

Following these names comes *Ranunculus paucistamineus* Tausch, var. *borealis* Beurl.[1] which was founded on the earlier (1839) *Ranunculus aquatilis*, var. *eradicatus* of Laestadius; but *R. paucistamineus* by many botanists, including the writer, is regarded as synonymous, at least in part, with *R. trichophyllus* Chaix. Then, in 1859, *Ranunculus lutulentus* was published by Songeon and Perrier[2] as a new species characteristic of the higher altitudes (7000 feet) of Switzerland and Savoy. According to Hiern,[3] who was apparently familiar with specimens of this plant, its habit approached that of *R. confervoides*. In Hiern's treatment, *R. lutulentus* is placed under *R. hydrocharis*, forma *Drouetii* which is extremely close to *R. trichophyllus*. Fortunately, I have been able to study authentic specimens of *R. lutulentus*, named by Perrier, which are in the Gray Herbarium.[4] A careful check of the characters of this plant have brought out the following: flowers 0.8–1 cm. in diam.; petals mostly 5-veined, narrow; stamens 8–10; carpels 16, glabrous; mature achenes rugulose to rugose, rarely smooth, glabrous; leaves short, petiolate, with filiformly dissected segments; stipules small, hairy when young; receptacle hairy. The habit of the plant is perhaps slightly more robust than in *R. confervoides* Fries, but not conspicuously so. All specimens examined, however, gave no indication of the development of the many adventitious roots characteristic of *R. confervoides*.

[1] Bot. Notis. l. c.

[2] Billot, Annot, Fl. Fr. et Allem. l. c.

[3] Journ. Bot. ix. 102 (1871).

[4] a. "Étang de la forêt de Aut-du-pré, au mont Mirantin (Hte. Savoie) E. Perrier, fl. 8bre; fr. 16 jt. 1857."

b. Près Conflans (Savoie), E. Perrier.

With the exception, then, of a few more carpels, slightly more rugose achenes, and the absence of adventitive roots, *R. lutulentus* is nearly identical with typical *R. confervoides*. Indeed, in as far as it differs, it seems to be quite a natural transition to *R. trichophyllus*. Of these two, however, it is obviously closer to *R. confervoides*, and probably ought to be considered as a form of that plant, for it is scarcely worthy of independent varietal rank.

Batrachium admixtum Nylander & Saellan,[1] according to Williams, does not differ in any way from his *R. divaricatus*, var. *eradicatus*. Williams states that *B. admixtum* occurred with *B. confervoides* in the Limingo district of Finland. The chief distinction between *B. admixtum* and the latter species was in the "Folia longius petiolata," which is hardly an important character.

I have also been fortunate enough to be able to examine authentic specimens[2] of *Ranunculus aquatilis*, γ. *saganensis* Regel & Radde.[3] A critical study of Radde's material has failed to show any conspicuous difference between it and *R. confervoides*. It is perhaps slightly more robust but otherwise it is practically identical with the exception of the rugose achenes. Here, as in the case of *R. lutulentus*, the plant is so close to *R. confervoides* that it scarcely seems possible to consider it as anything more than a form thereof. As a matter of fact, the importance of smooth achenes in *R. confervoides* is open to question since some of the European material[4] in the Gray Herbarium bears fruit which is definitely rugulose or rugose.

Ranunculus trichophyllus var. *demersus* N. E. Brown was described from a Scottish specimen which Williams regards as true *R. confervoides*. The very complete description checks exceedingly well with *R. confervoides*, with the exception of no mention of adventive roots. It appears, then, that *Ranunculus trichophyllus*, var. *demersus* is simply a smaller and more slender form of that species, which closely approaches var. *eradicatus*. It is significant to note what Brown has to say further regarding his plant. In part he writes: "From the opinion expressed by Prof. Lange in 'Florae Danicae' Vol. xvi., fasiculus 47, p. 7, it would appear that he inclines to the belief that the Scandinavian *R. confervoides* is a variety of *R. Drouetii*, which also seems to me to be the case, whilst I cannot

[1] Herb. Mus. Fenn., l. c.

[2] In alpibus Sajanensis, ex herbario horti Petropolitani: leg. Radde.

[3] Regel, l. c.

[4] a. In flumina Konkumuans, Lapponia enontekiensis, Iustus Montell, July 31, 1913 (rugose).

b. Uleåborg, Finlandia, Dr. W. Nylander, Jun. (smooth to rugulose).

specifically separate the Scotch plant from *R. trichophyllus*." It is thus probable that we are dealing here with a form of *R. trichophyllus* which very nearly approximates var. *eradicatus*.

Lawson, in his Review of the Canadian *Ranunculaceae*, took up the name *Ranunculus aquatilis* var. *confervoides* (Fries) Lawson for our plant. *R. aquatilis*, var. *eradicatus* of Laestadius was clearly an earlier name so that it should have taken precedence over *R. confervoides* Fries in Lawson's treatment. Apparently this study of the *Ranunculaceae* in North America was the first to include *R. trichophyllus*, var. *eradicatus* as a component of our flora.

Another combination was published by Williams as *Ranunculus divaricatus*, var. *eradicatus* (Laest.) Williams. This combination in effect crystallizes Lange's earlier opinion (above), since Williams' *R. divaricatus* is probably synonymous with *R. Drouetii* of later authors.

Similarly Hegi, in the Illustrated Flora of Mittel-Europa, iii. 584 (1912), regards *R. confervoides* as a variety of *R. flaccidus* Pers., *R. flaccidus*, var. *confervoides* (Fries) Hegi. However, this varietal combination seems unnecessary because of the priority of Laestadius' varietal name.

Gray did not mention this northern plant until the treatment in the Synoptical Flora where he also included it under *Ranunculus aquatilis* L., as variety *confervoides*.

7. R. **subrigidus**, sp. nov. (Tab. 406, figs. 1, 4, 10). Planta habitu *R. longirostri* similis; foliis omnibus submersis capillaceo-partitis circumscriptione fere orbiculatis subrigidis, foliis inferioribus subsessilibus vel petiolatis, superioribus sessilibus; stipulis villosis amplis tota longitudine petioli adnatis; floribus diametro 1–1.6 (plerumque 1.3–1.5) cm.; petalis 5–7-nerviis quam calyx subduplo longioribus; staminibus 10–22 (plerumque 15); carpellis 30–80 (av. 40) hirtis, stylo longitudine carpellam aequante; acheniis maturis 1–1.5 (av. 1.25) mm. longis glabris vel hirtis, rostello 0.1–0.5 (plerumque 0.25–0.3) mm. longo; receptaculo oblongo vel obovato 1–2.5 (plerumque 1.75–2) mm. longo piloso: caulibus immersis gracilibus plerumque elongatis; pedunculis quam folia plerumque longioribus.—Newfoundland and the Gaspé Peninsula of Quebec, south to western New England, where it is rare; west from Michigan to the Pacific, and south to northern Mexico. The following are representative: Quebec: dans les bras morts de Rivière Petite Cascapedia, *Victorin, Rolland* & *Jacques*, no. 33,337; York River, July 29, 1905, *Williams, Collins*, & *Fernald* (type in Gray Herb.); between the Forks and Brûlé Brook, Little Cascapedia River, *Collins, Fernald* & *Pease*, no. 5007. Vermont: Timmouth Creek, Timmouth, July 25, 1895,

Eggleston; Barnard Pond, Aug. 15, 1892, *Jesup* & *Sargent;* outlet of W. M. Evarts' Pond, Windsor, June 27, 1897, *Eggleston;* Mud Pond, Peacham, Aug. 2, 1884, *F. Blanchard* (U.S.). Massachusetts: Spring Brook Pond, Lanesboro, Berkshire Co., Aug. 15, 1916, *Churchhill.* Michigan: Liver-light Lakes, Iron Co., *F. P. Metcalf*, no. 2223 (U.S.). Manitoba: along line of Grand Trunk Ry., *Sewell, Macoun* & *Herriot*, no. 69,788. Minnesota: Stay Lake, Lincoln Co., *F. P. Metcalf*, no. 1784 (U.S.); Swan Lake, Nicollet Co., *F. P. Metcalf*, no. 44 (U.S.); Muskeg Bay, Lake of the Woods, ½ mile north of the mouth of Warroad River, Roseau Co., *Hotchkiss* & *Jones*, no. 412; Lake of Woods, Flag Island, *F. P. Metcalf*, no. 1534 (U.S.). North Dakota: Wallace, north of Dawson, *F. P. Metcalf*, no. 303 (U.S.); Long Lake, McHenry, *D. C. Mabbott*, no. 349 (U.S.); Driscoll Lake, Napoleon, *F. P. Metcalf*, no. 206 (U.S.); slough 7 miles east of Bismark, *F. P. Metcalf*, no. 354 (U.S.); Leeds, Benson Co., July 13, 1908, *Lunell* (U.S.). South Dakota: creek northeast of Camp Crook, Harding Co., *Vischer*, no. 5 (U.S.); sloughs, Sanborn Co., *Over*, no. 13,814 (U.S.); Beaver Creek, Mayo, Custer Co., *Over*, no. 1742 (U.S.), a somewhat atypical form. Texas: Pecos River, Ft. Smith to the Rio Grande, *J. M. Bigelow.* Assiniboia: Milk River Ridge, *Macoun*, no. 10,043 (U.S.); in pond on prairie, Parkby, June 10, 1905, *W. Palmer* (U.S.); Crane Lakes, June 16, 1894, *Macoun.* Alberta: Nab Pond, Wolf Creek, Craigmyle District, *Brinkman*, no. 594; Bow River Valley, *S. Brown*, no. 678 & 693; Calgary, *Macoun*, no. 18,043 (U.S.); Calgary, near Bow River, *M. A. Barber*, no. 221; Vermillion Lake, *McCalla*, no. 2120 (U.S.); small pond below hotel, Banff, *F. C. Prince;* Athabasca Landing, *A. B. Hitchcock*, no. 12, 099 (U.S.). Montana: Ringling, Aug. 5, 1921, *Wooton* (U.S.); Cliff Lake, Madison Co., *Rydberg* & *Bessey*, no. 4133 (U.S.); Columbia Falls, June 2, 1894, *R. S. Williams;* near inlet, Two Medicine Lakes, *Maguire*, no. 760; Bigfork, *M. E. Jones*, no. 795 (U.S.). Idaho: Henry's Lake, Fremont Co., *Nelson & Nelson*, no. 6799; Soda Springs, June 17, 1892, *Mulford;* Falk's Store, Canyon Co., *Macbride*, no. 301. Wyoming: Encampment, Carbon Co., *Tweedy*, no. 4228 (U.S.); La Barge, Uinta Co., *E. Stevenson*, no. 194 (U.S.); in spring-fed ponds, Evanston, Uinta Co., *Nelson*, no. 7195; Evanston, July 10–12, 1897, *T. A. Williams* (U.S.). Colorado: in Laramie River, Aug. 4, 1891, *Crandall* (U.S.); Fort Collins, *Cowen*, no. 21; Twin Lakes, *Wolf* & *Rothrock*, nos. 112 & 113; in slow running stream, Montrose, Payson, no. 113; Ouray, *Shear*, no. 4145 (U.S.); Colorado Springs, *Curtiss*, U.S. no. 202,203; Cañon City, May 1877, *Brandegee* (Cal.). Utah: Corinne, *A. Wetmore*, no. 418 (U.S.); Rabbit Valley, Aug. 21, 1875, *L. F. Ward* (U.S.). Nevada: Eagle Valley, Ormsby Co., *C. F. Baker*, no. 1052; Wadsworth, *Tidestrom*, no. 10,653 (U.S.). New Mexico: Mimbres River, Grant Co., *O. B. Metcalf*, no. 1047; Trout Spring, vicinity of Las Vegas, *Arsène*, no. 18,326 (U.S.); vicinity of Ute Park, Colfax Co., *Standley*, no. 13,674 (U.S.); Negrito Creek, Aug. 1, 1900, *Wooton* (U.S.); Bartlett Ranch, Colfax Co., Sept. 1, 1913, *Wooton* (U.S.). Arizona: Tuba Oasis,

Clute, no. 130; Lakeside, White Mts., *G. J. Harrison*, no. 5487 (U.S.), a form somewhat atypical. CALIFORNIA: Borax Lake, *J. Torrey*, no. 4; Lake Merced, San Francisco, July 17, 1892, *Blankinship;* Eagle Lake, Lassen Co., July 23, ? , *M. S. Baker* (U.S.); Shasta River, near mouth, Siskiyou Co., *G. D. Butler*, no. 361 (Cal.); Eagle Lake, July 25, 1894, *Baker* & *Nutting* (Cal.); Yreka, Siskiyou Co., May, 1903, *W. T. Mooney* (Cal.). OREGON: pond, upper gap, Lost River, Cascade Mts., Klamath Co., *Applegate*, no. 3477 (Cal.). WASHINGTON: junction of Crab and Wilson Creeks, Douglas Co., *Sandberg* & *Leiberg*, no. 265. MEXICO: Pacheo, Chihuahua, *Hartman*, no. 680; Sierra Madre, Chihuahua, *E. W. Nelson*, no. 6025 (U.S.); vicinity of Madera, Chihuahua, *Palmer*, no. 262 (U.S.); near Colonia Garcia, Sierra Madre, *Townsend* & *Barber*, no. 115; Rancho Colorado, District of Guerrero, Chihuahua, *Mexia*, no. 2570.

In its typical form (FIG. 1), *Ranunculus subrigidus* is superficially similar to the European *R. circinatus* with which it has long been confused. Upon close study, however, it is found that the larger size of the petals of the European plant and, consequently, the greater number of veins are features which set apart *R. circinatus* from our *R. subrigidus*. Moreover, the veins of the petals of the European *R. circinatus* are usually more forked toward the distal extremity. Further, the leaves of *R. subrigidus* are only subrigid and rather flaccid, whereas those of the Old World *R. circinatus* are usually very rigid and stiff.

In addition to the typical *R. subrigidus*, there are two or three recognizable forms of it. One form, which appears to be common in the southwestern United States, particularly in Arizona, New Mexico, southern Utah, southern Nevada, and northern Mexico has long, flaccid, many-segmented, mostly sessile dissected leaves, the primary divisions of which are often rather elongate. The floral and fruiting structures of this plant, however, appear to be identical with those of the more typical form of *R. subrigidus*. Another form, which seems to me to be more common in California, has more or less flaccid dissected leaves, many of which are often distinctly petiolate; but the more fundamental characters of the plant clearly indicate its affinity to *R. subrigidus*.

The distinctions between *Ranunculus subrigidus* and *R. longirostris* become the more evident the greater the number of plants of each species that are studied. *R. subrigidus* closely resembles *R. longirostris* in habit; but, normally, each species has distinctive fruit characters. For example, *R. subrigidus* has from 30–80 (av. 40) carpels per fruiting head, whereas *R. longirostris* bears from 8 to 30

(av. 16) carpels. The immature carpels of *R. subrigidus* have long styles which do not usually persist to any marked extent at maturity (FIG. 4). The persistent style-bases of *R. longirostris*, on the other hand, are prominent, usually attaining a length of 1 mm. (FIG. 11). The mature achenes of *R. subrigidus* vary in length from 1 to 1.5 (av. 1.25) mm., whereas in *R. longirostris* the range is from 1 to 1.6 mm.; but the average size is about 1.5 mm. Moreover, the receptacle of *R. subrigidus* (FIG. 10), while varying from 1 to 2.5 mm., usually is 1.75–2 mm. in length. In *R. longirostris* (FIG. 14), on the other hand, the size of the receptacle ranges from 0.75 to 2 mm., but usually lies between 1 and 1.5 mm.

8. R. LONGIROSTRIS Godron (FIGS. 2, 11, 14). Plants with dissected immersed leaves only; leaves more or less circinate, definitely sessile, with prominent hairy stipular sheaths usually ½–¾ adnate to the petiole: flowers 1–1.9 (usually 1.6–1.8) cm. in diameter: petal with 4–9 (av. 7) veins at the distal edge of the nectarial pit: stamens 10–18 (av. 15): carpels 8–30 (av. 16), glabrous or pubescent; mature achenes 1–1.6 (av. 1.5) mm. long, exclusive of the persistent style-base which is 0.3–1.5 (av. 1) mm. in length: receptacle 0.75–2 (usually 1–1.5) mm. long, mostly very hairy.—Essai, Mem. Soc. Roy. Nancy, 39, fig. ix. (1839); House, Mem. N. Y. State Museum xv. pt. 1, pl. 79A (1918), as *Batrachium circinatum* (Sibthp.) Reich., and Bull. N. Y. State Museum, no. 254: 339 (1924), as *Ranunculus longirostre* (*is*). *R. aquatilis* L., δ *stagnatilis* (Wallr.) DC., *sensu* Hook. Fl. Bor.-Am. i. 10 (1829), in part. *Batrachium longirostre* (Godr.) F. Schultz, Arch. Fl. Fr. et Allem. i. 71 (1842). *R. aquatilis* L., var. ? *trichophyllus* Lawson, Monogr. Ranunc. Can. and Adj. Pts. Brit. Am., Proc. & Trans. Nov. Scot. Inst. Nat. Sci. ii. pt. 4: 43 (1869). *R. hydrocharis* Spenn., forma *longirostris* (Godr.) Hiern, Journ. Bot. ix. 100 (1871). *R. aquatilis* L., var. *longirostris* (Godr.) Lawson, Rev. Can. Ranunc., Trans. Roy. Soc. Can. ii. sect. iv: 45 (1884). *R. circinatus* Sibth., *sensu* Gray, Rev. No. Am. Ranunc., Proc. Am. Acad. xxi. 363 (1886), in part. *Batrachium divaricatum* (Schrank) Wimm., *sensu* Britt. & Brown, Ill. Fl. ii. 84 (1897), in part. *B. circinatum* (Sibth.) Reichenb., *sensu* Britt. & Brown, Ill. Fl. ii. 116 (1913) in part.—In quiet waters (calcareous at least in eastern North America) from western Quebec to Oregon; south to Delaware, Pennsylvania, Tennessee, Nebraska, Kansas, Texas, Arizona and New Mexico. The following are representative: QUEBEC: Île Charron, Longueuil, *Victorin* & *Rolland*, no. 29,089; dans les îles de Sorel, Île aux Corbeaux, *Adrien*, no. 1974. MASSACHUSETTS: Lake Buel, New Marlboro, *Churchill* (probably). CONNECTICUT: small pond at Lakeville, Salisbury, Aug. 19, 1903, *Bissell;* in several feet of water, Mudge pond, Sharon, *Weatherby* & *Anderson*, no. 5900; Salisbury, June 3, 1931, *Weatherby* & *Drew*. NEW YORK: Cayuga Lake, north of RR. bridge, *Dean* & *Thomas*, no. 4049; in water of Sterling Creek, North Fairhaven, Cayuga Co., *Hughes* & *Douglas*,

no. 4050; "Red-house" bridge, s. Beaver Creek, north of Kingsbury St., Washington Co., July 14, 1900, *Burnham;* ponds along Lake Ontario, Woodville, *House*, no. 8156; slough-hole near Crass River, Canton, *Phelps*, no. 451; slow stream, Pecksport, Madison Co., July 10, 1918, *House;* stagnant pond, South Butler, Wayne Co., *Mac Daniels* & *Munz*, no. 6436; western New York, *Sartwell;* Thousand Islands, Aug. 8, 1879, *L. F. Ward* (U.S.); Sodus Bay, Wayne Co., July 12, 1884, *O. E. Pearce* (U.S.); Oswego River, Minneto, June 24, 1880, *O. E. Pearce* (U.S.); vicinity of Pittsford, Monroe Co., *Killip*, no. 2108 (U.S.). Pennsylvania: shallow pool in Common Creek, Tullytown, Bucks Co., Aug. 4, 1927, *Benner;* Presque Isle, Erie, June 2, 1880, *G. Guttenberg* (U.S.). Delaware: Wilmington, *Tatnall.* Ontario: Belmont, June 23, 1905, *G. L. Fisher;* in the Rideau River, near Ottawa, *J. M. Macoun*, no. 67,787; stagnant water, Galt, *Herriot*, no. 45; marshes, Wallaceburgh, *Macoun*, no. 33,588; near Sarnia, *Dodge*, no. 26; Squirrel Island, Lambton Co., Aug. 13, 1903, *Dodge* (U.S.); St. Thomas, June 23, 1905, *G. L. Fisher* (U.S.); Wingham, June 25, 1898, *J. A. Morton* (U.S.); edge of old canal, St. Catherine, *McCalla*, no. 377 (U.S.). Michigan: cove in Belle River, St. Clair Co., *Dodge*, no. 25; Vandercook's Lake, Jackson Co., May 29, 1896, *S. H.* & *D. R. Camp* (U.S.); Port Huron, June 3, 1896, *Dodge* (U.S.); pool nw. of Cedar Springs, June 18, 1897, *C. W. Fallass* (U.S.); Dexter, *Elmore Palmer* (U.S.); shallow streams, Hubbardston, 1880 (U.S.); Elizabeth Lake, Oakland Co., June 8, 1913, *B. F. Chandler* (U.S.); Mill pond, Alma, May 20, 1890, *C. A. Davis* (U.S.). Ohio: Mentor Marsh, Lake Co., July 9, 1923, *R. J. Webb;* East Twin Lake, Portage Co., *R. J. Webb*, no. 1300; Castalia, Aug. 23, 1895, *Moseley* (U.S.); Newark, 1888 (?), *Riddell* (U.S.); Vermillion, Erie Co., May 13, 1889, *L. M. McCormick* (U.S.); Lancaster, *J. M. Bigelow*, U.S. no. 798. Indiana: four miles east of Russelville in old Bayou of Raccoon Creek, *Grimes*, no. 499; Pine Lake, *Mell*, no. 119 (U.S.); Little Maxincuckee Lake, *Evermann*, no. 680 (U.S.). Tennessee: swamps along Cumberland River, 1886, *Gattinger* (U.S.), a semi-terrestrial mud-form. Wisconsin: shallow water, Lake Wingra, Dare Co., *Fassett*, no. 3526; Whitney's Slough of Green Bay, June 14, 1886, *Schuette;* Milwaukee, *Lapham;* Marshy Lake, vicinity of Delavan, *N. Hollister*, no. 15 (U.S.). Illinois: in shallow water, Stony Island, *Greenman*, no. 2616; in a swamp, Crystal Lake, Urbana, *Gleason*, no. 555; small pond north of Urbana, June 27, 1906, *Gleason;* Dorr's Pond near Mt. Carmel, June 30, 1888, *Schneck;* Lakes, St. Clair Co., May 25, 1877, *Eggert;* Bluffs Lake, *Eggert*, no. 27 (U.S.); near Oquawka, June 30, 1873, *Patterson* (U.S.). Iowa: Fayette, May 1894, *Fink;* Estherville, June 1881, *Cratty* (U.S.); Iowa City, June 19, 1883, *Shimek* (U.S.). Minnesota: Minnetonka, July 24, 1891, *Sandberg* (U.S.); Mississippi River, Clearwater Co., *J. B. Moyle*, no. 438; Silver Lake, Otter Tail Co., Aug. 1892, *Sheldon.* Missouri: Forest Mill, *E. J. Palmer*, nos. 3783, 2313. South Dakota: mouth of Spring Creek, Roberts Co., *Over*, no. 14467 (U.S.); White, June 17,

1893, *Thornber* (U.S.). NEBRASKA: Neligh, May 13, 1896, *E. S. Bacon;* Hershey, *Mell*, no. 88 (U.S.); Marsh Lake, *R. Thomson*, no. 26 (U.S.); Willow Lake, *R. Thomson*, no. 123 (U.S.); Petersoon Lakes, *R. Thomson*, no. 333 (U.S.), a sterile plant; in Dismal River, Thomas Co., July 13, 1889, *H. J. Webber* (U.S.); Keya Paha, *F. Clements*, no. 2867 (U.S.); in Lodge Pole Creek near Lodge Pole, Cheyenne Co., Aug. 29, 1891, *Rydberg* (U.S.). KANSAS: ponds, Riley Co., *Hitchcock*, no. 976. TEXAS: Lipscomb, *A. H. Howell*, no. 11 (U.S.); bed of Limpia, *Wright*, nos. 437, 835. MONTANA: North fork, Iona River, *Scribner*, no. 2; Shields River above Wilsall, *Suksdorf*, no. 97; Ennis, July 27, 1898, *E. A. Maynard;* Boiling River, *P. H. Hawkins*, no. 755 (U.S.). COLORADO: pond, Denver, Denver Co., *Duthie* & *Clokey*, no. 3764; divide between Arkansas & South Platte Rivers, at "Elbert" station on RR., circa 1883, *R. W. Woodward*. UTAH: Jordan Valley, *S. Watson*, no. 15; along Sevier River, above Marysville, *Rydberg* & *Carlton*, no. 6930 (U.S.); Cache Co., June 27, 1897, *J. H. Linnford* (U.S.). NEVADA: Mountain City, *Nelson* & *Macbride*, no. 2202; alkali flat, Elko, *A. E. Hitchcock*, no. 943 (U.S.); in water, vicinity of Cold Creek, *A. E. Hitchcock*, no. 1072 (U.S.), lacking fruit. NEW MEXICO: Rio Mimbres, *Thurber*, no. 216. ARIZONA: El Paso and Ft. Yuma Wagon Rd. Expedition, *Sutton Hayes*, no. 7. OREGON: Lt. Mullen's Expedition, U. S. no. 801.

Ranunculus longirostris is best treated as a distinct species, endemic in North America, which is closely related to *R. subrigidus* and more remotely to the European *R. circinatus*. The presence of the long, persistent style-base of the mature achene of *R. longirostris* was the fundamental character upon which Godron based the species. The distinctions between *R. subrigidus* and *R. longirostris* have been emphasized in the discussion of the former.

Ranunculus longirostris can be separated from *R. trichophyllus* with little difficulty since the long beak of the achene and the sessile, more or less circinate leaves sharply set it off from the latter. A further rather striking difference between the two species is shown by the broad, hairy, auricled stipular sheaths which characterize the leaves of *R. longirostris*. Only very rarely do the stipular sheaths of *R. trichophyllus* approach the size attained in the long-beaked *Batrachium*. Moreover, the amount of adnation of the stipular sheaths of *R. longirostris* is much less than in *R. trichophyllus* in which the sheaths are mostly completely adnate to the petioles.

Ranunculus longirostris has frequently been confused with one species or another by North American taxonomists. The plant was not recognized as a distinct species until Godron described it from a specimen in Riehl's Herbarium, which was labelled *R. divaricatus* Schrank.[1] The type station is given by Godron as follows: "Hab.

[1] Riehl, pl. exs. no. 52 sub nomine R. divaricati Schranck.

in aquis fluentibus Americae Borealis propè Saint Louis, Missouri." There is no doubt from the clear description and the accompanying plate that Godron was dealing with a typical plant of the species. The early *Ranunculus aquatilis, δ stagnatilis* of Hooker (1829) and of Torrey and Gray (1838) included both *R. longirostris,* which had not been recognized at that date, and *R. subrigidus.* Lawson, in his later (1884) studies on the Canadian *Ranunculi,*[1] treated *R. longirostris* as a variety of *R. aquatilis.* From his description it is evident that he was dealing with an abnormal plant of *R. longirostris,* since that species does not appear to develop adventitious roots extensively under normal conditions. In his earlier work (1870),[2] Lawson refers to *R. aquatilis,* var. *trichophyllus*? which, judging from the fact that this specimen was included under *R. aquatilis,* var. *longirostris* of the later publication (1884), was probably the plant treated here as *R. longirostris.* At any event, Lawson was the first North American botanist to recognize this characteristic *Batrachium* as something different from the European *R. circinatus.* In 1886, Gray, in his Revision of the North American *Ranunculi,*[3] studied the *Batrachia* extensively; but he included *Ranunculus longirostris* under *R. circinatus.* Largely following the treatment of Britton and Brown,[4] Davis, in his taxonomic study of the North American *Ranunculaceae,*[5] reverts to the misinterpreted name, *Batrachium divaricatum* (Schrank) Wimm., to include *Ranunculus longirostris* and the exclusively Old World *R. circinatus.* As explained under the discussion of *R. divaricatus,* in relation to *R. trichophyllus,* the former name was misapplied by many continental botanists, including Wimmer, to the true *R. circinatus,* on the basis of the word "tellerförmig" by which Schrank characterized the foliage of his plant. Williams[6] has since pointed out the true nature of Schrank's plant. In the meantime, unfortunately, the misinterpreted European *R. divaricatus* found its way into several North American botanical studies as our circinate-leaved *Batrachium.*

Greene[7] described a *Batrachium usneoides* from a peculiar plant collected at Lake City, Arkansas.[8] I have examined the plant from

[1] Trans. Roy. Soc. Can. ii. sect. iv. 45 (1884).
[2] Proc. & Trans. Nov. Scot. Inst. Nat. Sci. ii. pt. iv: 42–43 (1869).
[3] Proc. Am. Ac. xxi. 363 (1886).
[4] Ill. Fl. ii. 84 (1897)
[5] Minn. Bot. Studies ii. 460–462 (1900).
[6] Journ. Bot. xlvi. 14 (1908).
[7] Leaflets Bot. Obs. & Crit. ii. 106 (1910).
[8] ARKANSAS: Lake City, *A. H. Howell,* no. 606 (U. S.).

the original collection which is now in the United States National Herbarium. A study of this material shows that the young achenes, apparently hitherto unnoticed, are very similar, in having long styles, to those of *R. longirostris*. It seems likely that if mature fruiting specimens of the plant were collected, its close relationship to *R. longirostris* would be evident, since in other characters *B. usneoides* approaches *R. longirostris*. Thus, for example, the much-divided, dissected leaves of *B. usneoides*, unique as far as I know among *Batrachian Ranunculi*, are quite sessile, though primary, secondary, and even tertiary divisions are long-stalked. Moreover, these essentially sessile leaves are subtended by large hairy stipular sheaths of the *R. longirostris* type. For the present, then, *B. usneoides* seems better regarded as a somewhat unusual form of *R. longirostris;* in the event that more complete specimens of this plant are secured, its true affinities will become known.

9. **R. pueblensis,** sp. nov. (TAB. 406, FIGS. 3, 7). Planta habitu *R. trichophyllo* similis; foliis omnibus submersis capillaceo-partitis sessilibus, segementis primariis longe petiolulatis (0.6–1 cm.); stipulis amplis immaturis connatis; staminibus plerumque circa 10–12; carpellis 10–12, glabris; acheniis maturis longissimis, circa 2.5–3 mm. longis; rostello breve et crasso subrecurvato; receptaculo obovato piloso circa 2 mm. longo. *R. trichophyllus,* var. *mexicanus* Lévl. Bull. Geogr. Bot. xxii. 184 (1912), not *R. mexicanus* Davis, Minn. Bot. St. ii. 487 (1900).—This extremely local plant has been collected from only one station. MEXICO: Puente de Animas, alt. 2140 m., vicinity of Puebla, State of Puebla, *Bro. Nicolas,* no. 5948 (TYPE in Gray Herb.).

Although this plant appears to have been collected from only one station in Mexico, it is distinct enough from *R. trichophyllus,* which it simulates in general habit, to be worthy of separate specific rank. The achenes of *R. pueblensis* (FIG. 7) are markedly different from those of *R. trichophyllus* (FIG. 13), in that they are very large (2.5–3 mm., as contrasted with the usual length of 1.25–1.5 mm. in *R. trichophyllus*) and bear comparatively stout persistent style-bases which tend to be recurved. Moreover, the pattern of wrinkles is much coarser than that of the usual achene of *R. trichophyllus.* Furthermore, the leaves of *R. pueblensis* (FIG. 3), though long and more or less flaccid, as in *R. trichophyllus,* are sessile (or rarely short petiolate) at the top of the stipular sheaths; but the primary divisions are long-stalked. The leaves of *R. trichophyllus* are usually very definitely long-petiolate. A complete flower was missing from my specimen, but from the size of the head of stamens and carpels I judge it to be about 1.5 cm. in diameter.

Although *R. pueblensis* has sessile leaves as in *R. longirostris*, its achenes are much larger than those of *R. longirostris* (FIG. 11), 2.5–3 mm. as contrasted with 1.5 mm. in typical *R. longirostris*, and are about half as numerous (8–10 in *R. pueblensis* as against an average of 16 for *R. longirostris*). Whereas the leaves of *R. longirostris*, though usually sessile, are more or less definitely circinate in outline, those of *R. pueblensis* are never of that type. Moreover, the stipular sheaths of *R. pueblensis* are not the broad hairy flaring type found in *R. longirostris*. It appears to me, then, that this Mexican plant is wholly distinct from any known North American and European species. Indeed, the only other species of *Batrachium* in North America which bears large fruits at all comparable to those of *R. pueblensis* is *R. Lobbii*, the achenes of which attain an average size of 2.25 mm. However, the achenes of *R. Lobbii* bear a very small and distinctly lateral beak (FIG. 12), whereas those of *R. pueblensis* possess stout, more or less recurved persistent style-bases, sub-terminal in position. Thus, *R. pueblensis*, like numerous other plants from the vicinity of Puebla, Mexico, is clearly an endemic species.

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EXPLANATION OF PLATE 406

FIG. 1, portions of flowering stems, × 1, of RANUNCULUS SUBRIGIDUS n. sp., from TYPE, York River, Gaspé Co., Quebec, July 29, 1905, *Williams, Collins & Fernald;* FIG. 2, portions of flowering stems, × 1, of R. LONGIROSTRIS Godron, from Sarnia, Lambton Co., Ontario, *C. K. Dodge*, no. 26; FIG. 3, portion of stem, × 1, of R. PUEBLENSIS, n. sp., from the TYPE, Puente de Animas, Puebla, Mexico, *Nicolas*, no. 5948; FIG. 4, achenes, × 10, of R. SUBRIGIDUS, from the TYPE; FIG. 5, plant, × 1, of R. TRICHOPHYLLUS Chaix, var. ERADICATUS (Laest.) Drew, from vicinity of Harry's River, Newfoundland, *Fernald & Wiegand*, no. 3408; FIG. 6, receptacle, × 10, of R. TRICHOPHYLLUS, var. TYPICUS, from California, 1864, *Bolander;* FIG. 7, achenes, × 10, of R. PUEBLENSIS, from the TYPE; FIG. 8, achenes, × 10, of R. TRICHOPHYLLUS, var. CALVESCENS, n. var., from the TYPE, Crams River, Danvers, Massachusetts, July 2, 1885, *J. H. Sears;* FIG. 9, receptacle, × 10, of R. TRICHOPHYLLUS, var. CALVESCENS, from the TYPE; FIG. 10, receptacle, × 10, of R. SUBRIGIDUS, from the TYPE; FIG. 11, achenes, × 10, of R. LONGIROSTRIS, from Sarnia, Ontario; FIG. 12, achenes, × 10, of R. LOBBII (Hiern) Gray, from Corvallis, Oregon, April 23, 1934, *H. M. Gilkey;* FIG. 13, achenes, × 10, of R. TRICHOPHYLLUS, var. TYPICUS, from California, 1864, *Bolander;* FIG. 14, receptacle, × 10, of R. LONGIROSTRIS, from Sarnia, Ontario.

2. var. AUSTRALIS Pollard, Bot. Gaz., xxvi. 342 (Nov. 1898). Based on specimens from Duval Co., Florida, with much larger leaves, decurrent on the winged petioles. In spite of Brainerd's remarks in his monograph, this is not quite the same thing as Eaton's var. *villosa.*

3. V. REPTABUNDA Greene, Leaflets, ii. 94 (1910). Based on plants from Moultrie, Georgia, collected by *Roland M. Harper,* of which a sheet of the type number is before me. This is a mere autumnal state of ordinary *V. primulifolia,* in which the plants are small and low, the largest leaves distinctly subcordate-deltoid, with long runners, rooting and forming new plants. It should have no taxonomic status whatever.

4. V. SENECIONIS Greene, loc. cit. Based on plants from southeastern Maryland along the Nanticoke River, flowering in late August. Remarkable for its very large and broad leaves of subcordate-oval outline. If we dismiss from our minds the idea that all these characters are "specific," it is apparent that *V. senecionis* is a far earlier name for a southern leaf-extreme than *V. rugosa* Small.

The question now arises to what extent the characters back of all these names have any real morphological or geographic significance. My impression of the extensive material in the Gray Herbarium is that there is very little. What is true is that in the southern half of the range only, we find plants with villous or pubescent leaves and petioles, and other plants with much larger leaves, some of which have a marked subcordate base, *at vernal flowering* season. Everyone knows that the later leaves of most of our violets tend to be much larger and often differ in shape from the earlier ones; *var. australis* Pollard is based on this type of material and this name can be forgotten. The plants with very large subcordate leaves may be either glabrous or pubescent, small-leaved plants may also be glabrous or pubescent, and plants exactly resembling normal *V. primulifolia* are more abundant in the southeast than any of the extremes. In this mass of interlocking variations I see only one good geographic variety, and an extreme leaf form.

1. V. PRIMULIFOLIA var. VILLOSA A. Eaton. Already characterized above. Ranging north to southern New Jersey.

2. Forma **subcordata,** forma nova. Foliis maioribus subcordatis vel rariore cordatis, saepe crassioris vel rugosis. TYPE: edge of cypress swamp, west end of Lake Iamonia, Leon County, Florida, March 29, 1934, *Griscom,* no. 21582; now in Gray Herbarium. North along the coast to southeastern Maryland.

While this is no place for a thorough discussion of the problem, these notes confirm my impression that "speciation" has been absurdly overdone in southern violets, and I am convinced that there are also too many in the Gray's Manual range.

Although *R. pueblensis* has sessile leaves as in *R. longirostris*, its achenes are much larger than those of *R. longirostris* (FIG. 11), 2.5–3 mm. as contrasted with 1.5 mm. in typical *R. longirostris*, and are about half as numerous (8–10 in *R. pueblensis* as against an average of 16 for *R. longirostris*). Whereas the leaves of *R. longirostris*, though usually sessile, are more or less definitely circinate in outline, those of *R. pueblensis* are never of that type. Moreover, the stipular sheaths of *R. pueblensis* are not the broad hairy flaring type found in *R. longirostris*. It appears to me, then, that this Mexican plant is wholly distinct from any known North American and European species. Indeed, the only other species of *Batrachium* in North America which bears large fruits at all comparable to those of *R. pueblensis* is *R. Lobbii*, the achenes of which attain an average size of 2.25 mm. However, the achenes of *R. Lobbii* bear a very small and distinctly lateral beak (FIG. 12), whereas those of *R. pueblensis* possess stout, more or less recurved persistent style-bases, sub-terminal in position. Thus, *R. pueblensis*, like numerous other plants from the vicinity of Puebla, Mexico, is clearly an endemic species.

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NOTES FROM NORTHWESTERN FLORIDA

Ludlow Griscom

Amelanchier canadensis (L.) Medic. On March 31, 1934 I was botanizing in the rich hill country near Tallahassee with Mr. Francis W. Hunnewell, when he called my attention to a small tree of Amelanchier just past flowering, more or less lost in the wealth of flowering trees and shrubs, by which we were surrounded. Specimens were promptly collected. Study of these at the Gray Herbarium shows that they cannot be separated from the well known *A. canadensis;* in fact our sheets agree minutely with several from western Massachusetts. No member of the genus is recorded from Florida, and *A. canadensis* is unreported south of the hills of northern Georgia. The exact locality is rich hillside woods, west end of Lake Iamonia, Leon County, Florida; *Griscom*, no. 21578; duplicate presented to Gray Herbarium. The range extension involved is not, however, particularly surprising. The hill country in northwestern Florida is already well known as the southern limit of many Alleghanian upland types or for the presence of local endemics representing them. I have never seen an authentic specimen of *A. alabamensis* Britton, but the alleged specific characters separating it from *A. canadensis* do not exist in my material.

Viola Langloisii Greene. This little known "species" apparently represents *V. affinis* LeConte in the far south, but is readily separable by the conspicuous spreading auricles of the sepals. In Small's recent Manual it is recorded no further east than Mississippi. In Northeastern Florida this group is represented by *V. chalcosperma* with even longer auricles and bronze instead of buff seeds. There is some confusion about leaf characters, as Small treats *V. Langloisii* as having entire leaves at vernal flowering time, and *V. chalcosperma* as having 3-lobed leaves. This is not correct, as Brainerd's original distribution of *V. chalcosperma* includes one sheet with entire leaves, and Brainerd described *V. Langloisii* var. *pedatiloba* in 1911. He failed to mention this variety in his monograph of the Violets (1921), but does say that "it often exhibits a form with 3–5 pedately lobed leaves." There is also confusion here, as the type number of Brainerd's var. *pedatiloba does not have* the longer spreading auricles of *V. Langloisii.* In other words it is *V. affinis* with lobed leaves.

Finally, material recently received at the Gray Herbarium shows a sheet from Richmond, Henrico County, Virginia (*Randolph*, no. 261)

which is clearly transitional to *V. Langloisii*, and a sheet from Jackson, western Tennessee (*Bain*, no. 342) is also clearly transitional. This last sheet is particularly instructive as one of the flowers has much longer auricles to the sepals than two other flowers on the same plant.

The facts, therefore, would appear to be that in the far south *Viola affinis* exhibits well marked variation in that the leaves tend sometimes to be lobed and the auricles to the sepals are longer and more spreading. There are two varieties as follows:

1. Viola affinis var. **Langloisii** (Greene), comb. nov. Auricles of sepals relatively stout, 2 mm. long; seeds (normally?) buff; not uncommon in northwestern Florida. *V. Langloisii* Greene, Pittonia, iii. 87 (1896).—My collections are: No. 21585, March 31, 1934, low rich woods along stream bank, Orchard Pond Plantation north of Tallahassee, Leon Co.; No. 21584, March 31, 1934, rich shaded bank of Ochlockonee River near Sisson, Gadsden County.

2. Viola affinis var. **chalcosperma** (Brainerd) comb. nov. Auricles of sepals very slender, 3–4 mm. long; seeds (always?) bronzy.—*V. chalcosperma* Brainerd in Bull. Torr. Bot. Cl. xxxvii. 523 (1910).

Viola rugosa Small, Manual, 1933, pp. 891 and 1506, is based on specimens collected at Telogia, Liberty County, Florida, just west of Leon County, near the Alabama line. The specific character, "leaf-blades rugose, cordate tapering at base," is so striking in the field that a specimen was immediately collected in a colony on the edge of a cypress swamp at the west end of Lake Iamonia, Leon County on March 29, 1934: my number 21582, now in Gray Herbarium. Nevertheless *V. rugosa* is a mere extreme in leaf form of the common *V. primulifolia*, which also grows in Leon County. Several sheets from Florida, Mississippi and Louisiana in the Gray Herbarium approach the *rugosa* extreme in one way or another.

There are, however, nomenclatural difficulties, as *V. rugosa* Small (1933) is preoccupied by *V. rugosa* A. Phil. (1922) for a species from Chili. It is consequently most undesirable to use the name *rugosa* varietally under *V. primulifolia*. There are further difficulties in that there are two varietal names for *V. primulifolia*, which must be considered, as well as two proposed "species" of Greene.

1. V. primulifolia var. villosa A. Eaton, Manual, 5th ed., p. 443 (1829). Based on a specimen from Georgia, with densely villous to hoary petioles, a common extreme in the south, in which the foliage is often notably pubescent also. If specimens with a few scattered hairs on the under surfaces of the leaves and along the petioles be eliminated, there is marked geographic segregation here, and the variety should be recognized.

2. var. AUSTRALIS Pollard, Bot. Gaz., xxvi. 342 (Nov. 1898). Based on specimens from Duval Co., Florida, with much larger leaves, decurrent on the winged petioles. In spite of Brainerd's remarks in his monograph, this is not quite the same thing as Eaton's var. *villosa*.

3. V. REPTABUNDA Greene, Leaflets, ii. 94 (1910). Based on plants from Moultrie, Georgia, collected by *Roland M. Harper*, of which a sheet of the type number is before me. This is a mere autumnal state of ordinary *V. primulifolia*, in which the plants are small and low, the largest leaves distinctly subcordate-deltoid, with long runners, rooting and forming new plants. It should have no taxonomic status whatever.

4. V. SENECIONIS Greene, loc. cit. Based on plants from southeastern Maryland along the Nanticoke River, flowering in late August. Remarkable for its very large and broad leaves of subcordate-oval outline. If we dismiss from our minds the idea that all these characters are "specific," it is apparent that *V. senecionis* is a far earlier name for a southern leaf-extreme than *V. rugosa* Small.

The question now arises to what extent the characters back of all these names have any real morphological or geographic significance. My impression of the extensive material in the Gray Herbarium is that there is very little. What is true is that in the southern half of the range only, we find plants with villous or pubescent leaves and petioles, and other plants with much larger leaves, some of which have a marked subcordate base, *at vernal flowering* season. Everyone knows that the later leaves of most of our violets tend to be much larger and often differ in shape from the earlier ones; *var. australis* Pollard is based on this type of material and this name can be forgotten. The plants with very large subcordate leaves may be either glabrous or pubescent, small-leaved plants may also be glabrous or pubescent, and plants exactly resembling normal *V. primulifolia* are more abundant in the southeast than any of the extremes. In this mass of interlocking variations I see only one good geographic variety, and an extreme leaf form.

1. V. PRIMULIFOLIA var. VILLOSA A. Eaton. Already characterized above. Ranging north to southern New Jersey.

2. Forma **subcordata**, forma nova. Foliis maioribus subcordatis vel rariore cordatis, saepe crassioris vel rugosis. TYPE: edge of cypress swamp, west end of Lake Iamonia, Leon County, Florida, March 29, 1934, *Griscom*, no. 21582; now in Gray Herbarium. North along the coast to southeastern Maryland.

While this is no place for a thorough discussion of the problem, these notes confirm my impression that "speciation" has been absurdly overdone in southern violets, and I am convinced that there are also too many in the Gray's Manual range.

On Nomenclature in Cornus.—Recently I revived[1] the epithet *Schuetzeana* for a variety of *Cornus Amomum* Miller. Buhl[2] criticized the adoption of Meyer's epithet as a "dubious name . . . doubtfully proposed from specimens supposedly collected near Washington, a place where this form, if it occurs at all, is very scarce." The argument might be allowed to pass quietly away, with other squabbles over nomenclature, were it not that such words may definitely mislead those who have not seen Meyer's paper. There is nothing in this to indicate that the name was "doubtfully proposed." The specimen with which it was associated was described in the words: *foliis oblongis basi attenuatis, subtus tuberculatis glaucescentibus, setis rufescentibus (etiam in foliis junioribus) nullis.* In this we have no difficulty in recognizing the common variety later called *C. Purpusi* by Koehne. The reference to reddish hairs is explained by the inclusion of the variety in *C. sericea* (the name then used for *C. Amomum*). As to the "supposed" origin of the specimen, we read "*prope Washington lecta* (Schütze)"; there seems no sufficient reason to suspect error here. There is no need for argument about the actual occurrence of the variety near Washington. Specimens may be seen in the local collection of the U. S. National Herbarium (for example, No. 478400, *G. B. Sudworth*, June 1, 1891). Whether or not it is rare there has, of course, no bearing on its name. The only escape from the adoption of var. *Schuetzeana* Meyer is the admission that Meyer did not in fact use the word "variety," but the α, β, and γ usual at that time; these have, of course, been always interpreted as varieties by the authors themselves. The inadvisability of dealing with this variety as a species is demonstrated by the large number of intergrading forms between it and typical *C. Amomum* represented in such collections as I have studied.

As to the identity of *C. candidissima* Miller, discussed in the same two papers, we cannot, indeed, be so sure. It is perhaps worth while to connect, by however meagre a chain of reasoning, one of Miller's species with an actual specimen, dating from his own time. If any possible coincidence of the specimen and certain descriptions is to be dismissed with certain remarks about the poverty of specimens and of observation in those days, then much nomenclatural research must be discarded, and Linnaeus himself should not be taken as seriously as he has been.—H. W. Rickett, University of Missouri.

[1] Rhodora **36**: 274 (1934).
[2] Ibid. **37**: 222–223 (1935).

[Other notes discussing the nomenclature of these shrubs have been received. Since they are partly based upon incomplete understanding of the points discussed, the Editors have felt it inexpedient further to prolong the discussion. Unless quite new evidence is brought to light the subject will be considered closed.—Eds.]

Gnaphalium calviceps, a Correction. In Rhodora, xxxvii. 449, t. 405 (December, 1935) I described a new species which on the labels of the type-specimens, on the plate, in the discussion on pp. 449 and 450, in the explanation of the plate on p. 454 and in the index, immediately following, was called, as I intended, *G. calviceps*. Through a *lapsus typographicus vel calami vel clericus vel stenographicus* the name at the beginning of the diagnosis was unfortunately rendered *G. calvescens.* Although the error was caught in indexing, the correction failed to get entered on the proof-sheet. The name *G. calvescens,* an evident *lapsus,* should have been *G.* **calviceps.**—M. L. Fernald.

Albino Iris versicolor.—In his detailed study[1] of *Iris versicolor* L. and its more southern relative, *I. virginica* L., Dr. Edgar Anderson stated that "Complete albinos with no trace of color other than yellow have been found only in *I. virginica.*" It is, consequently, interesting to receive from Mrs. Agnes M. Ayre of St. John's, Newfoundland, a specimen of a complete albino of *I. versicolor* from a colony of about a dozen plants, discovered on July 4, 1935 by her brother-in-law, Andrew Murray. This form may be called

Iris versicolor L., forma **Murrayana,** f. nov., floribus albidis, sepalis petalisque basin versus lutescentibus.—Bank of Salmonier River, near its mouth, Newfoundland, July 4, 1935, *Andrew Murray* (type in Gray Herb., comm. *A. M. Ayre*).—M. L. Fernald.

[1] Edgar Anderson, Ann. Mo. Bot. Gard. xv. 297 (1928).

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A KEY TO THE SPECIES OF OAKS OF EASTERN NORTH AMERICA BASED ON FOLIAGE AND TWIG CHARACTERS

Sarah C. Dyal

There is at present no adequate means for the identification of oaks by their leaves alone, without information concerning the fruit, twigs, bark, and other characteristics not ordinarily available on herbarium specimens. Since poor herbarium specimens and other more or less fragmentary material are constantly coming in for identification it was thought desirable to determine whether a practical key could be devised based on leaf characters only. After much detailed study of all of the various characters connected with the oak leaves such as the type, size, branching, spread, color, abundance, and distribution of the hairs, shape, size, thickness, and color of the leaf, size and shape of the upper epidermal cells, venation on the upper surface of the leaf, the distal angle between the principal veins and the midrib, and the length of the petiole, and after many trials, the appended key was prepared, which on testing has seemed to meet our needs. It is hoped that it may be of use to others faced with similar problems of identification.

The key was intended to include all the species and varities of oaks occurring east of the Mississippi River but owing to a lack of material *Q. microcarpa* Small and *Q. succulenta* Small were finally omitted.

The material forming the basis of this study was that in the herbarium of Cornell University and some sent in by botanists from various sections of the area covered. After the first draft of the key was made the material at the Gray Herbarium, the Arnold Arboretum, the New York Botanical Garden, the Field Museum, the

University of Minnesota, and the University of Michigan was examined as a check to the results previously obtained.

To render the key more easily usable a few explanatory notes are perhaps in order. Special attention should be called to the two fundamental types of hairs found on oak leaves. The most conspicuous is a non-glandular commonly branched type distributed over the surface of the leaf or confined to the veins or vein axils. This type itself falls into two subtypes, depending on the way in which the branches spread from the hair axis as to whether these branches spread all at one point or above one another. In addition to this non-glandular type there is generally another kind which is usually more minute and less conspicuous. These hairs are generally appressed or occasionally looser, and are usually of a distinctly stellate structure though rarely simple. The cell walls in these hairs are irregular and give a viscid impression as viewed under the microscope though there is little evidence of actual viscosity as indicated by debris attached to them. They have been designated "glandular hairs"[1] by other authors and the term is retained, but they should not be confused with the capitate type of glandular hairs to which the term is usually applied.

While many features of the various hairs may be seen by inspecting the leaf with a hand lens or low power microscope, for accurate study it is desirable to remove some of the hairs to a glass slide where they may be teased apart, covered with a cover glass and observed under higher magnification. For measuring the spread of the hair branches an eye-piece micrometer was used. For measuring the thickness of the leaves a cover-glass micrometer was employed.

1. Non-glandular hairs entirely absent from both surfaces of the leaf when mature. (A form of *Q. lyrata* is entirely glabrous except for a few non-glandular and almost simple hairs scattered along the midrib and veins beneath.)....2.
  2. Upper epidermal cells markedly elongated over the smaller veinlets; apex and lobes of leaves rounded or notched, without bristle tips....3.
    3. Base of leaf auricled.............................1. *Q. robur* L.
    3. Base of leaf rounded or cuneate....4.
      4. Leaves 5–9-lobed with sinuses ½ or more of the way to the midrib, usually glaucous beneath and usually with minute appressed glandular hairs scattered over the lower surface.............................2. *Q. alba* L.
      4. Leaves entire or shallowly 3–13-lobed with the sinuses less than ½ of the way to the midrib, or 3-lobed with the sinuses about ½ of the way to the midrib....5.

[1] Engelmann, George. About the Oaks of the United States. Trans. St. Louis Acad. Sci. 3: 372–400. 1868–77 (Repr. "Botanical Works," Ed. Wm. Trelease and Asa Gray. 1887).

5. The leaves 3–13-lobed with sinuses one third or more of the way to the midrib or rarely entire. ....3. *Q. austrina* Small.
5. The leaves entire or shallowly 3–5-lobed with the sinuses less than one third of the way to the midrib................................4. *Q. Durandii* Buckl.
2. Upper epidermal cells slightly elongated or isodiametric over the smaller veinlets; apex of leaf acute and usually bristle-tipped............................5. *Q. laurifolia* Michx.
1. Non-glandular hairs present on one or both surfaces of the leaf though often confined to the veins or even vein axils....6.
6. Leaves with non-glandular hairs distributed over the lower surface or scattered along the midrib and principal veins, rarely in conspicuous tufts in the axils of the veins and then the lower surface densely pubescent....7.
7. Branches of the non-glandular hairs spreading at the same distance from the surface of the leaf, the hairs loose or appressed; leaves usually without bristle tips....8. White Oaks (except No. 26).
8. Non-glandular hairs sessile or very nearly so, appressed or loose....9.
9. Leaves entire or shallowly lobed with the sinuses usually less than one third of the way to the midrib. (Sometimes deeply 3-lobed near the middle in No. 3.)....10.
10. Upper epidermal cells markedly elongated over the smaller veinlets....11.
11. Margin of leaves entire or shallowly 3–5-lobed....12.
12. The leaves yellowish or grayish brown beneath; glandular hairs usually present; non-glandular hairs scattered over the upper surface or sometimes only on the midrib; glandular and non-glandular hairs present on the petiole....13.
13. Petioles more than 5 mm. long; leaves shallowly 3–5-lobed; twigs scurfy pubescent........................ 21. *Q. stellata* Wang., var. *Boyntonii* (Beadle) Sarg.
13. Petioles usually less than 5 mm. long; leaves entire or shallowly 3-lobed toward the apex; twigs nearly smooth... ....6. *Q. Chapmanii* Sarg.
12. The leaves silvery white or pale green beneath; glandular hairs absent; upper surface glabrous or sometimes a few non-glandular hairs near the base of the midrib; petioles glabrous or sometimes with a few non-glandular hairs....14.
14. Leaves silvery white and densely pubescent beneath, or pale green with non-glandular hairs scattered over the entire lower surface; leaves entire or but slightly lobed at the apex ....4. *Q. Durandii* Buckl.
14. Leaves pale green beneath, with non-glandular hairs scattered along the midrib and veins beneath; leaves shallowly 3–5-lobed...................3. *Q. austrina* Small.
11. Margin of leaves coarsely serrate, deeply sinuate-dentate, or crenate-serrate....15.

15. Non-glandular hairs on the lower surface of the leaf of two sizes mixed (the larger loose, 2–8-branched with a spread of 0.40–0.60 mm., the smaller appressed, (2)–4–8-branched with a spread of 0.15–0.30 mm.); or all large, loose, and 8–15-branched with a spread of 0.20–0.40 mm....16.
  16. Non-glandular hairs on the lower surface of the leaf gray; some of the principal veins ending in the sinuses......7. *Q. bicolor* Willd.
  16. Non-glandular hairs on the lower surface of the leaf of two colors, small ones gray and the larger ones yellow; principal veins ending in the lobes.................12. *Q. prinoides* Willd., var. *rufescens* Rehder.
15. Non-glandular hairs on the lower surface of the leaf all of about the same size, small, appressed; or if larger, then loose with a spread of 0.20–0.40 mm. and simple or 2–4–(5)-branched....17.
  17. Leaves with a pair of sinuses about the middle or below wider and deeper than the others; some of the principal veins often ending in the sinuses.18. *Q. macrocarpa* (form)
  17. Leaves with sinuses essentially uniform; principal veins ending in the lobes....18.
    18. Non-glandular hairs on the lower surface of the leaf a mixture of simple, 2–3 or –4-branched hairs, rarely with a few 5-branched hairs mixed with others, the 5-branched hairs when present loose with a spread of more than 0.20 mm.....19.
      19. Spread of the non-glandular hairs on the lower surface of the leaf 0.08–0.20 mm., mostly appressed; lower surface of the leaf rough to the touch; minute appressed glandular hairs usually scattered over the lower surface............8. *Q. montana* Willd.
      19. Spread of the non-glandular hairs on the lower surface of the leaf 0.20–0.40 mm., loose; lower surface of the leaf soft to the touch; glandular hairs usually absent...........9. *Q. Prinus* L.
    18. Non-glandular hairs on the lower surface of the leaf a mixture of 4–12-branched appressed hairs with a spread of usually less than 0.20 mm.....20.
      20. Leaves with 8–13 teeth on each side (sometimes small leaves with 6 teeth on each side on the same twig with the large leaves); teeth usually acute............10. *Q. Muhlenbergii* Engelm.
      20. Leaves with 5–8 teeth on each side, teeth usually obtuse ....11. *Q. prinoides* Willd.
10. Upper epidermal cells not markedly elongated over the smaller veinlets....21.
  21. Non-glandular hairs on the lower surface of the leaf loose, with a spread of 0.20–0.40

mm.; leaves strongly reticulate-venulose on the lower surface......................
.....14. *Q. virginiana* Mill., var. *geminata* (Small) Sarg.

21. Non-glandular hairs on the lower surface of the leaf appressed, with a spread of 0.10–0.20 mm.; leaves less strongly reticulate-venulose on the lower surface. (Larger and broader leaves somewhat more reticulate.)....22.
22. Leaves usually entire............13. *Q. virginiana* Mill.
22. Leaves repand-dentate or the upper ones sometimes entire......................
...15. *Q. virginiana* Mill., var. *dentata* (Chapm.) Sarg.

9. Leaves lobed with the sinuses more than one third of the way to the midrib. (If 3-lobed, the lobes above the middle.)....23.
23. Base of leaf auricled........................1. *Q. robur* L.
23. Base of leaf rounded or cuneate....24.
24. Petiole pubescent, usually scurfy; non-glandular hairs on the petiole a mixture of 4–8-branched hairs....25.
25. Non-glandular hairs on the lower surface of the leaf of two sizes mixed (the larger loose, 2–8-branched with a spread of 0.30–0.60 mm., the smaller appressed, 4–8-branched with a spread of 0.15–0.30 mm.)..........................7. *Q. bicolor* Willd.
25. Non-glandular hairs on the lower surface of the leaf all of about the same size....26.
26. Leaves silvery white beneath with appressed non-glandular hairs dense, or scattered over the entire surface; glandular hairs absent or inconspicuous; more than three pairs of principal veins ending in the lobes, others ending in the sinuses........16. *Q. macrocarpa* Michx. and
17. var. *olivaeformis* (Michx. f.) Gray.
26. Leaves tawny beneath with loose non-glandular hairs scattered along the midrib and veins; glandular hairs usually dense beneath giving a yellowish appearance to the surface of the leaf; only two or three pairs of principal veins ending in the lobes....27.
27. Leaves with 5–(7) diverging lobes, the base short-cuneate or rounded......
........................19. *Q. stellata* Wang.
27. Leaves with 3 ascending lobes, the base long-cuneate.....................
........20. *Q. stellata* Wang., var. *paludosa* Sarg.
24. Petiole usually glabrous, sometimes with a few simple or 2-branched non-glandular hairs....28.
28. Leaves with glandular hairs absent on the lower surface....29.
29. Lower surface of leaf silvery white; non-glandular hairs usually dense on the lower surface of the leaf........22. *Q. lyrata* Walt.
29. Lower surface of leaf pale green; non-glandular hairs scattered over the lower surface or only on the midrib and veins............23. *Q. lyrata* Walt. f. *viridis* Trel.

28. Leaves with minute appressed glandular hairs scattered over the lower surface .....2. *Q. alba* L.

8. Non-glandular hairs distinctly pedicellate (pedicel 4 or more times the width of the hair branch), loose....30.

30. Leaves 3–8-lobed....31.

31. Non-glandular hairs on the lower surface of the leaf all cream colored............................24. *Q. stellata* Wang., var. *Margaretta* (Ashe) Sarg.

31. Non-glandular hairs along the midrib and veins beneath yellowish, others cream colored......................25. *Q. stellata* Wang., var. *arinosa* Sarg.

30. Leaves entire except on vigorous shoots, then toothed....32.

32. Leaves 0.18–0.35 mm. thick with strongly revolute margins and without bristle tips; non-glandular hairs on the lower surface of the leaf of two sizes mixed (the larger, loose, the smaller, appressed)..........................14. *Q. virginiana* Mill., var. *geminata* (Small) Sarg.

32. Leaves 0.07–0.14 mm. thick, without revolute margins, and with bristle tips; non-glandular hairs on the lower surface of the leaf all of about the same size, usually with a very long pedicel.......................26. *Q. imbricaria* Michx.

7. Branches of the non-glandular hairs spreading at different distances from the surface of the leaf (the uppermost often forming a whorl, the internodes often suppressed giving a "burr-like" appearance to the hair); leaves usually with bristle tips....33. Black Oaks.

33. Leaves entire or slightly lobed on vigorous shoots....34.

34. Ultimate veinlets raised on the upper surface of the leaf; leaves with 9–13 or more pairs of principal veins; tufts of hairs absent in the axils of the veins beneath..........................27. *Q. pumila* Walt.

34. Ultimate veinlets sunken on the upper surface of the leaf; leaves with 6–9 pairs of principal veins; tufts of brownish hairs sometimes present in the axils of the veins beneath............28. *Q. cinerea* Michx.

33. Leaves lobed....35.

35. Lower surface of leaf usually densely tomentose; glandular hairs when present more or less hidden among the non-glandular hairs....36.

36. Leaves 3–7 (usually 3–5)-lobed the sinuses broad and shallow....37.

37. Lower surface of leaf canescent, base cuneate. ....29. *Q. ilicifolia* Wang.

37. Lower surface of leaf tawny, base usually rounded........32. *Q. rubra* L., f. *triloba* (Michx.) Ashe.

36. Leaves 3–11 (usually 5–11)-lobed the sinuses broad and deep....38.

38. Leaves with terminal lobe much elongated and all of the lobes more or less falcate; usually tawny beneath.......................30. *Q. rubra* L.

38. Leaves with all of the lobes about equal, usually not falcate, canescent beneath.......................31. *Q. rubra* L., var. *pagodaefolia* Ashe.

35. Leaves with scattered pubescence beneath; appressed amber-colored glandular hairs usually present beneath and conspicuous, either over the entire lower surface or along the midrib and veins..............................33. *Q. velutina* Lam.

6. Leaves with non-glandular hairs in tufts which are in the axils of some or all of the primary veins beneath or extending along the midrib and in some species also scattered over the lower surface. (In some species the tufts are very small, consisting of only a few hairs in some of the primary vein axils.)........................39. BLACK OAKS.
39. The leaves entire or shallowly 3–5-lobed....40.
40. Leaves markedly dilated upward, usually with hairy petioles....41.
41. Lower surface of leaf yellow-brown or conspicuously yellow-green, scurfy with appressed branched amber-colored glandular hairs; leaves sometimes shallowy 3–5-lobed; base of leaf narrowly rounded or cordate........34. *Q. marilandica* Muench.
41. Lower surface of leaf pale-green but not conspicuously yellow-green; glandular hairs when present not conspicuous; base of leaf cuneate....42.
42. Leaves entire or undulate at the apex........35. *Q. nigra* L.
42. Leaves 3-lobed at the apex.................................36. *Q. nigra* L., var. *tridentifera* Sarg.
40. Leaves not markedly dilated upward; petiole usually glabrous....43.
43. Upper epidermal cells markedly elongated over the ultimate veinlets........................35. *Q. nigra* L.
43. Upper epidermal cells slightly elongated or isodiametric over the ultimate veinlets....44.
44. Leaves with cream- to amber-colored glandular hairs and also sometimes non-glandular hairs scattered over the lower surface; leaves 2–5 cm. long, oval to oblong-obovate, with strongly revolute margins................37. *Q. myrtifolia* Willd.
44. Leaves with glandular hairs absent on the lower surface, non-glandular hairs usually confined to tufts or sometimes scattered along the sides of the midrib beneath; leaves 4–13 cm. long, ovate-lanceolate, elliptic-lanceolate, or rhombic (rarely oblong-obovate), without strongly revolute margins (slightly revolute in *Q. laurifolia*)....45.
45. Leaves ovate-lanceolate, sometimes oblong-obovate with 3–5 coarse teeth toward the apex, somewhat glossy above and dull beneath.............................38. *Q. phellos* L.
45. Leaves elliptic-lanceolate or rhombic, glossy on both surfaces....46.
46. Leaves yellow-green and elliptic-lanceolate in outline...................5. *Q. laurifolia* Michx.
46. Leaves blue-green and rhombic, sometimes broadest above the middle.....................39. *Q. laurifolia* Michx., var. *rhombica* Trel.
39. The leaves deeply 3–13-lobed or if shallowly lobed with 5–7 lobes....47.
47. Petiole of larger leaves from 0.2–1.5 cm. long....48.
48. Leaves with petioles less than 0.5 cm. long......................................35. *Q. nigra* L. (form).
48. Leaves with petioles from 0.5–1.5 cm. long....49.
49. The leaves 0.12–0.22 mm. thick, usually falcately lobed, and usually very glossy on the upper surface; midrib broad, one millimeter or more wide at the base, raised on the upper surface........................40. *Q. Catesbaei* Michx.

49. The leaves 0.07–0.11 mm. thick, the lobes usually nearly or quite straight, glossy above but not conspicuously so; midrib slender, less than one millimeter wide at the base. . 41. *Q. georgiana* M. A. Curtis.

47. Petiole of larger leaves from 1.5–7.5 cm. long. (Usually 2–7.5 cm. long). . . . 50.

50. Non-glandular hairs in the axils of the veins beneath a mixture of 10–20-branched hairs. . . . 51.

51. Principal leaf lobes or some of them with one or two small bristles on the sides of the lobe less than 5 mm. from the apex; lobes rather blunt. . . . 52.

52. Leaves with upper principal pair of sinuses narrow and curving forward, all sinuses usually rounded at the base; principal veins, except the lowest pair, nearly or quite straight, ascending or diverging; bud scales usually gray . . . . 42. *Q. Shumardii* Buckl. and 43. *Q. Shumardii* Buckl., var. *Schneckii* (Britton) Sarg.

52. Leaves with upper principal pair of sinuses wide and spreading, some of the sinuses truncate at the base; principal veins usually curved, diverging, lowest pair usually more strongly curved; bud scales reddish brown. . . . . 44. *Q. palustris* Muench.

51. Principal leaf lobes without small bristles on the sides of the lobe less than 5 mm. from the apex; lobes usually long-tapering . . . 45. *Q. Nuttallii* E. J. Palmer.

50. Non-glandular hairs in the axils of the veins beneath a mixture of 4–8–(10)-branched hairs. . . . 53.

53. Burr-like non-glandular hairs usually scattered over the lower surface or along the midrib in addition to the non-glandular hairs in the tufts in the vein axils; midrib pubescent on the upper surface of the leaf; amber glandular hairs usually present on the lower surface of the leaf, scattered over the surface or only along the midrib and veins; petioles scurfy pubescent all over or only on the upper side, sometimes only near the base, rarely glabrous; buds densely gray tomentose . . . . 33. *Q. velutina* Lam.

53. Burr-like non-glandular hairs usually absent on the lower surface of the leaf, when present confined to the tufts in the vein axils; midrib usually glabrous on the upper surface of the leaf; glandular hairs absent; petiole usually glabrous, sometimes with a few scattered non-glandular hairs; buds glabrous or only pubescent above the middle. . . . 54.

54. Principal lobes of the leaf usually broadest at the base, tapering toward the apex; length of the lobes less than or equalling the width of the broad middle portion of the leaf (rarely one and one half times the middle portion) . . . . 46. *Q. borealis* Michx. f. and 47. *Q. borealis*, var. *maxima* (Marsh.) Ashe.

54. Principal lobes of the leaf broadest at the apex or with the sides nearly or quite parallel; the length of the largest lobes two or more times the width of the narrow middle portion of the leaf. . . . 55.

55. Trees of uplands; winter buds red or orange-brown. . . .56.
56. Range from northwestern Indiana to Manitoba, south to northern Missouri; winter buds usually glabrous and shining. . . . . .48. *Q. ellipsoidalis* E. J. Hill.
56. Range from Maine and southern Ontario to southern Nebraska, southward to North Carolina, Alabama and Arkansas; winter buds usually pubescent toward the tip. . . . . .49. *Q. coccinea* Muench.
55. Trees of lowlands; winter buds reddish-gray or gray. . . . . .42. *Q. Shumardii* Buckl. and 43. *Q. Shumardii* Buckl., var. *Schneckii* (Britton) Sarg.

4. Q. Durandii Buckl. Two forms of this species occur, one with leaves green beneath and the other with leaves white-tomentose on the lower surface. Trelease[1] has considered these as mesophytic and xerophytic forms respectively. Dr. E. J. Palmer states that he has found both leaf forms on the same tree which would indicate that the variations are of little ecological or taxonomic importance.

7. Q. bicolor Willd. Here, as in *Q. Durandii*, two leaf types as to pubescence occur, one green and the other white-tomentose beneath. Trelease has considered these as mesophytic and xerophytic forms with the implication that the first one is a woodland form but this point needs further study. This green form has been designated by Trelease as var. *mollis* Nutt.

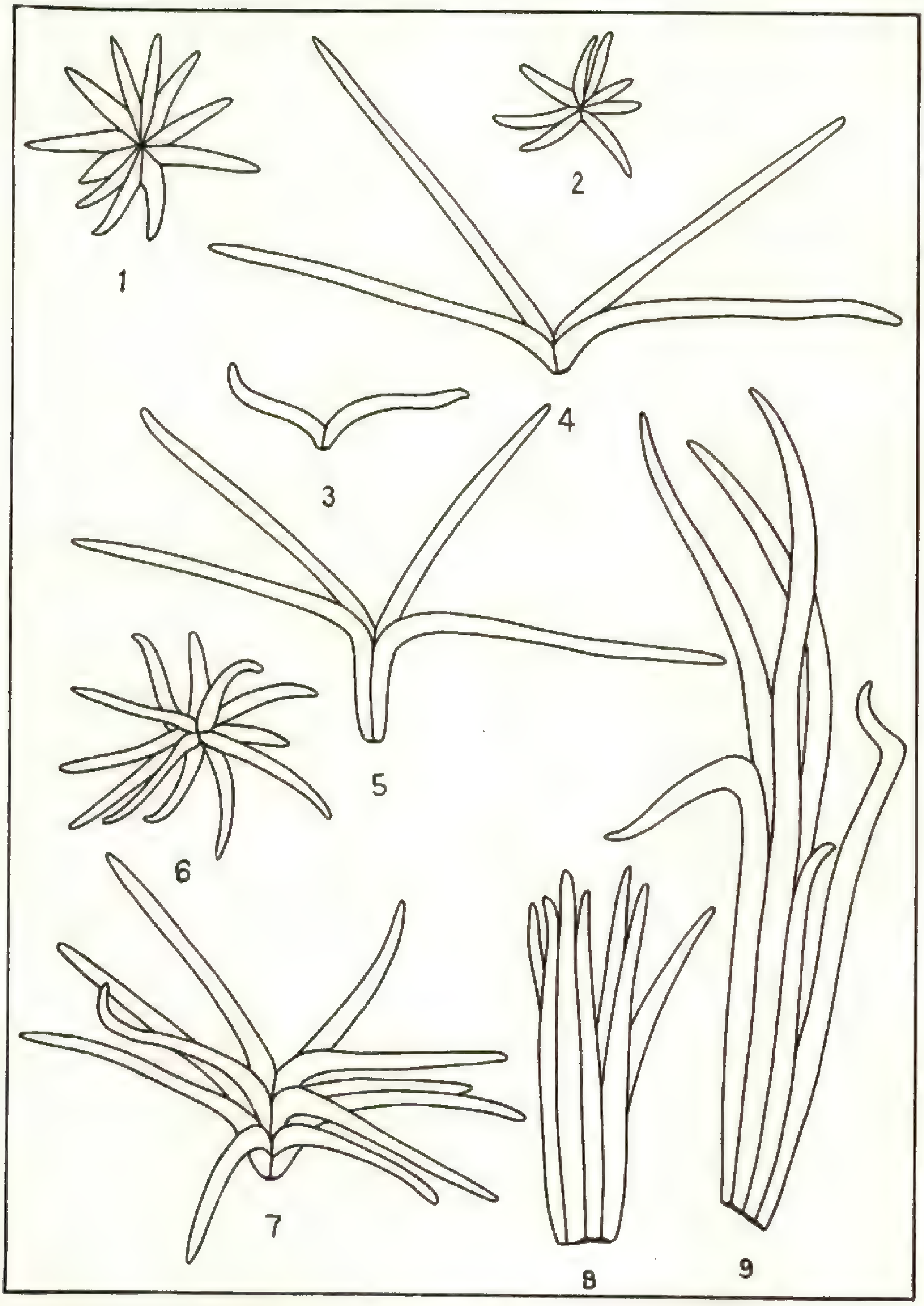
8. Q. montana Willd. *Q. Prinus* L. of most authors (see Sargent, Rhodora, **17**, 40, 1915).

9. Q. Prinus L. *Q. Michauxii* Nutt. of most authors (see Sargent, Rhodora, **17**, 40, 1915).

14. Q. virginiana Mill., var. geminata (Small) Sarg.[2] This is recognized as a distinct species by Small and undoubtedly it lies on the border line as to distinctness. The much larger hairs may be added in support of Small's contention, but the general variability of foliage and habit in this species has seemed to indicate the desirability of a conservative point of view at least for the present. A low form with more repand-serrate leaves may be recognized as var. *dentata* (Chapm.) Sarg. The hairs in this variety resemble those of the typical form but tend to have fewer branches. Other leaf forms have been recognized as distinct varieties by Sargent but are of doubtful taxonomic value.

22. Q. lyrata Walt. As in *Q. Durandii* and *Q. bicolor* there is in this species also a green and a whitened leaf form. Whether these are woodland and exposed types as suggested by Trelease should be more fully investigated.

[1] Trelease, Wm. The American Oaks. Mem. Nat. Acad. Sci. **20**: 7. 1924.
[2] Sargent, C. S. Bot. Gaz. **65**: 445, 446, 1918.



NON-GLANDULAR HAIRS OF QUERCUS

WHITE OAK TYPE: FIG. 1, *Q. virginiana* and FIG. 2, *Q. Muhlenbergii*, top view of sessile appressed hair; FIG. 3, *Q. montana* and FIG. 4, *Q. stellata*, side view of sessile hair; FIG. 5, *Q. imbricaria*, side view of pedicellate hair.

BLACK OAK TYPE: FIG. 6, *Q. cinerea*, top view; FIG. 7, *Q. velutina*, side view.

VEIN AXIL TYPE: FIG. 8, *Q. borealis* and FIG. 9, *Q. velutina*, side view.

24. Q. STELLATA Wang., var. MARGARETTA (Ashe) Sarg. This form has been treated variously, as a species, as a variety and as a possible hybrid of *Q. alba* and *Q. stellata.* In opposition to the latter interpretation may be mentioned the pedicellate hairs which are sessile in both of the supposed parents, and the absence of glandular hairs which are found on the leaves of both parents. Also there is a denser pubescence on the mature leaves than on either *Q. alba* or *Q. stellata.* On the other hand there is little to warrant its recognition as a species. The difference in acorn size emphasized by Small does not seem to exist in our specimens. The variation in leaf shape and in the pedicel of the hair seems scarcely sufficient to constitute a species without other supporting characters.

26. Q. IMBRICARIA Michx. This is the only black oak studied having the white oak hair type but it is easily distinguished from the other entire-leaved oaks both black and white by the large pedicellate non-glandular hairs on the lower surface of the leaf.

Three specimens of the so-called *Q. Leana* Nutt. (one from Biltmore, N. C. and two from Ohio) are at hand. *Q. Leana* is usually interpreted as a hybrid of *Q. velutina* and *Q. imbricaria.* These specimens are interesting from the standpoint of hair types with reference to the supposed parentage. When the leaves are young the upper surface is furnished with the "burr-like" hairs of the black oak group (including *Q. velutina*) while the hairs of the lower surface are of the *imbricaria* type. At maturity the upper surface of the leaves has become entirely glabrous but the lower surface is still tomentose with the *imbricaria* type of hair. These hair types seem to support the supposed hybrid parentage.

28. Q. CINEREA Michx. The leaves of this species are often confused with those of *Q. virginiana* but the hairs are very different and serve as a good means of identification.

30. Q. RUBRA L. *Q. falcata* Michx. of many authors (see Sargent, RHODORA, **18**: 45, 1916).

46. Q. BOREALIS Michx. f., var. MAXIMA (Marsh.) Ashe. *Q rubra* of many authors (see Ashe, Proc. Soc. Am. Foresters, **11**: 90, 1916). This variety is not separable from the typical form of the species on leaf characters alone.

48. Q. ELLIPSOIDALIS E. J. Hill. Owing to the similarity in leaf characters of this species, *Q. coccinea, Q. Shumardii,* and *Q. Shumardii* var. *Schneckii,* it was considered best to separate these species on habitat, bud characters, and distribution.

CORNELL UNIVERSITY.

SOME ADVENTITIOUS PLANTS IN CONCORD, MASSACHUSETTS

Richard J. Eaton

While crossing a large sandy field overlooking the Sudbury River in Concord in June, 1934, my attention was attracted by an abundance of a shrubby *Hypericum*, *Pentstemon Digitalis* Nutt., several species of *Artemisia*, and numerous other strange plants too immature to recognize. Repeated visits during the next four months yielded a surprisingly long list of introduced species not previously reported from Concord nor, in some instances, from New England. Two species of *Artemisia* may prove to be new to the Gray's Manual range. The identifications were carefully checked at the Gray Herbarium. Mr. C. A. Weatherby kindly assisted in assigning provisional names to the Artemisias.

In the following annotated list the dates given are those on which were collected the specimens now deposited in the herbarium of the New England Botanical Club. A single asterisk (*) indicates a species not previously reported from Massachusetts, and two (**) not previously reported from New England, in so far as the author can discover. For data concerning "extra-limital" distribution not available in the herbarium of the New England Botanical Club I am indebted to the following institutions: Gray Herbarium, New York Botanical Garden, and the Brooklyn Botanic Garden.

Triodia flava (L.) Hitchc. September 20, 1934. Fairly abundant.

Dianthus Armeria L. Not previously reported from Concord. Scattered specimens observed.

Lepidium campestre (L.) R. Br. Abundant in a restricted area.

Arabis glabra (L.) Bernh. Not previously reported in Concord and clearly introduced here. Scarce.

A. Drummondi Gray. The typical pale-flowered form is indigenous on rocky talus in one or two localities in Concord. The present specimens rank and weedy, with prominent purplish flowers, drying to a deep purple. Mr. Milton Hopkins, a monographer of this genus, concurs in the determination but writes that the present plant is a purple-flowered extreme only met in his experience in collections from Texas. Apparently well established.

Melilotus officinalis (L.) Lam. August 19, 1934. Scarce.

**Hypericum densiflorum Pursh. July 18, 1934. A single large plant in profuse flower and fruit. A southern species reaching New Jersey and Long Island.

H. prolificum L. July 18, 1934. Abundant. Rarely spontaneous in eastern Massachusetts and Connecticut, otherwise absent from New England.

Echium vulgare L. July 8, 1934. Scarce. Recently collected at one other station in Concord.

Verbena stricta Vent. July 19, 1934. Well established. The third station in eastern Massachusetts. Rarely spontaneous in Connecticut. Otherwise absent from New England.

Monarda mollis L. July 18, 1934. Abundant. Considered sparingly indigenous in eastern Massachusetts, but doubtless adventive here.

*Pycnanthemum pilosum Nutt. August 6, 1934. Well established. Reported from a single Connecticut station. Otherwise absent from New England.

Vernonia fasciculata Michx. September 20, 1934. Scarce but vigorous. A single collection from Medford, Massachusetts, in 1886. Otherwise absent from New England.

Eupatorium serotinum Michx. September 9, 1934. Common. Apparently new to New England, except for a single plant collected at a nursery in North Abington, Massachusetts, in 1933 (Gray Herbarium).

Grindelia squarrosa (Pursh) Dunal. August 6, 1934. Abundant. Specimens seen from seven stations in Maine, Massachusetts, Rhode Island, and Connecticut.

Aster novae-angliae L. var. roseus (Desf.) DC. September 20, 1934. Fairly common. Differs from the species in this vicinity in its tolerance of dry soil and in its frequent habit of growing in single stems rather than in clumps.

Helianthus scaberrimus Ell. August 13, 1934. A large patch. Specimens seen from seven scattered stations in Maine, Massachusetts, Rhode Island, and Connecticut.

Helenium nudiflorum Nutt. August 6, 1934. Abundant. Occurs sparingly at two other stations in Concord and in three other towns in eastern Massachusetts. Scattered stations elsewhere in New England.

H autumnale L. September 9, 1934. Rather common. Formerly abundant in a wet meadow near Concord Village. Reported from a single station in Essex County, Massachusetts. Probably indigenous in Berkshire County, Massachusetts, and central and western Connecticut.

Artemisia ludoviciana L. July 8, 1934. Rather scarce. Upper surface of leaves more tomentose than typical material. Reported from a dozen stations in Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut.

**A. mexicana Willd. August 11, 1934. Not scarce. Indigenous from Missouri southwestward. Single specimens seen from Franklin Lakes, New Jersey, and from Nashville, Tennessee, otherwise apparently unreported from east of the Mississippi River.

*A. gnaphalodes Nutt. August 6, 1934. Common. Reported from scattered stations from Quebec and New Brunswick southward to Delaware.

**A. tridentata Nutt. September 20, 1934. Common. Fruiting plants scarce. Apparently the first report of occurrence east of the Great Plains, and new to Gray's Manual range.

A. Absinthium L. August 13, 1934. Common. A form with abnormally narrow leaf segments occurs sparingly and was collected on August 6, 1934. Occasional throughout New England.

A. frigida Willd. July 8, 1934. A single specimen in close bud, but determination probably correct. Reported from Worcester, Massachusetts, in 1918 and from one station in Connecticut, otherwise absent from New England.

Centaurea maculosa Lam. August 6, 1934. Scarce. Sparingly introduced at scattered stations throughout New England.

In all probability the foregoing list will prove to be an incomplete inventory of the waifs from the West and South which are finding a congenial habitat in Concord. The summer was very dry and much vegetation, particularly the grasses, failed to reach maturity.

Originally a large Indian camp site, more recently under constant cultivation, and for two or three years ending in 1929 rented to Mr. Jelle Roos, the well-known commerical bulb grower, this ten acre tract of light sandy loam overlying a deep bed of sand and gravel has lain fallow for the past five years. The ground was not seeded to grass by Mr. Roos when he quitted his tenancy, nor has the vegetation been mowed or burned since that time according to the owner. One of many gray birch seedlings which have come in was by ring-count 5 years old in 1934.

It is of more than casual interest to find such a concentration of well established immigrants from the West, several of which are distinctly rare in New England. One species in particular—the sage bush of the alkali deserts—is apparently new to New England, if not to the entire country east of the Great Plains. The latter plant certainly betrays no marked ability to establish itself beyond the borders of its natural range, and yet we find it in comparative abundance with occasional fruiting specimens in eastern Massachusetts growing in a supposedly siliceous soil so characteristic of the region.

In all likelihood, the seeds of all these plants were accidentally introduced in sheep manure by the last tenant.[1] Ecological conditions were obviously favorable for germination and subsequent development. Undisturbed by plow, scythe, or fire, they now form a con-

[1] Mr. Roos writes under date of March 1, 1935: "I can explain the collection of Western weeds you found there by the fact that I used an uncleaned sheep manure which I bought from a man who obtained it from woolen mills in Lowell or Lawrence. This sheep manure contained a large percentage of wool combings, in which the weed seeds could plainly be seen when I received it."

spicuous element of the vegetation. Even so, there may be some obscure factor operating at this particular site which is absent from a multitude of other fallow fields where there would appear to be an equally good chance to harbor a similar collection of well established western weeds. Farmers have been using sheep manure from the woolen mills for years. Seeds of *Artemisia tridentata,* for example, must have been scattered far and wide in this manner; and yet here apparently is the first recorded occurrence of this species in eastern North America.

I am not disinclined to suspect that the "obscure factor" may have some connection with the aboriginal tenants of the field. At first sight, this may seem far-fetched, and yet rotted clam shells still exist in sufficient quantities to justify the local name Clam Shell Bluff. Probably of no more than mere coincidence is the fact that with the exception of sporadic specimens of a few of the species, the introduced plants are concentrated on precisely that part of the field where arrow heads formerly were abundant. In other words, they are now growing in the *close* vicinity of the very spots where the Indians erected their wigwams, and practically nowhere else.

Cambridge, Massachusetts

NOTES ON OEDOGONIUM AND BULBOCHAETE IN THE VICINITY OF WOODS HOLE, MASSACHUSETTS[1]

Chin-Chih Jao

(Plate 407)

It was hoped that the writer's paper on *Oedogonium* in the vicinity of Woods Hole, Massachusetts,[2] would be nearly complete for the region. Altogether, including both new and known forms, fifty-one species, varieties and forms were reported. During 1934, from June to August, the writer had an opportunity to continue his investigation of the freshwater algae in this region, with the result of finding some new plants of this genus, or unreported stations for fruiting *Oedogonia,* which were not included in the writer's first paper. These are listed in the first part of this paper. In the course of the studies on *Oedogonium,* a number of well fruited Bulbochaetes were identified. These plants are rather common around Woods Hole, but only a few species

[1] Papers from the Department of Botany and Herbarium of the University of Michigan, No. 505.

[2] Rhodora, Vol. 36, No. 426, P. 197–214, Pl. 286–288, June, 1934.

are represented in the writer's collections, of which *Bulbochaete Furberae* Collins and *B. Brebissonii* Kuetzing are most common. The second part of this paper is a preliminary report dealing with *Bulbochaete* as collected at Woods Hole and vicinity, Barnstable County, Massachusetts, mostly in the summer seasons from 1932 to 1934.

The materials were mostly collected by the writer and Miss H. T. Croasdale; the writer wishes to thank her for her kindness in permitting the study of her samples. This study was made at the Marine Biological Laboratory, Woods Hole and in the Botanical Laboratories of the University of Michigan, under the direction of Professor Wm. R. Taylor, to whom the author is deeply grateful for help and valuable advice.

I. OEDOGONIUM

1. Oedogonium concatenatum (Hassall) Wittrock. "Beede's Oscillatoria Pond," North Falmouth, July 31, 1934 (*Croasdale*). Very abundant, attached to water grasses.

2. Oedogonium crenulatocostatum Wittrock f. cylindricum Hansgirg. Long Pond, Falmouth, 1929; "West Wood Pond," North Falmouth, Aug. 4, 1934 (*Croasdale*).

3. Oedogonium crispum (Hassall) Wittrock var. gracilescens Wittrock. "Scar Spring," a small spring near the west shore of Naushon Island, June 18, 1934 (*Jao and Croasdale*); "Pasque J" Pond, Pasque Island, June 25, 1934 (*Jao*); Long Pond, Falmouth, 1929.

4. Oedogonium crispum Wittrock var. uruguayense Magnus & Wille. "Pasque K" Pond, Pasque Island, June 26, 1934 (*Jao*).

5. Oedogonium Croasdaleae Jao. "Endicott Hollow," Endicott Road, in Woods Hole, Aug. 8, 1934 (*Croasdale*).

6. Oedogonium cryptosporum Wittrock. "Scar Spring," Naushon Island, June 18, 1934 (*Jao and Croasdale*).

7. Oedogonium cryptosporum Wittrock var. vulgare Wittrock. "Sheep Pen Pond," Nonamesset Island, June 18, 1934 (*Jao and Croasdale*).

8. Oedogonium echinospermum Al. Braun. The local plants have dwarf males on or near the suffultory cell, stipes 1- to 3-celled, lower stipes 10–13 μ diam., 25–32 μ long, upper stipes 9–12 μ diam., 19–27 μ long. Collected in a pond near South Yarmouth, July 21, 1932.

9. Oedogonium hians Nordstedt & Hirn var. **megasporum**, var. nov. (Figs. 1, 2). Oedogonium dioicum, nannandrium, idioandrosporum; oogoniis 1–7, subglobosis, operculatis circumscissione superiore apertis; oosporis globosis, raro subglobosis, transversum oogonia fere complentibus vel complentibus, membrana laevi et crassa; androsporangiis 1–3 (–?); cellulis suffultoriis tumidis; nannandribus subtiliter curvatis, in cellulis suffultoriis sedentibus;

antheridiis exterioribus; cellulis vegetativis subtiliter capitellatis; cellula basali tumida; cellula terminali obtusa.

Cell. veg.	11–19 μ diam.,	64–102 μ long.
Oogonia	45–55 μ diam.,	48– 83 μ long.
Oosporae	44–48 μ diam.,	44– 58 μ long.
Cell. suffult.	35–38 μ diam.,	64– 74 μ long.
Androsporangia	19 μ diam.,	22– 26 μ long.
Nannand. stipes	11–13 μ diam.,	39– 45 μ long.
Antheridia	8–10 μ diam.,	6– 8 μ long.

Dioecious, nannandrous, idioandrosporous; oogonia 1–7, subglobose, operculate, division superior; oospore globose, rarely subglobose, nearly filling or filling the oogonium transversely, spore-wall smooth and thick; androsporangia 1–3(–?); suffultory cell swollen; dwarf male slightly curved, attached to the suffultory cell; antheridia exterior; vegetative cells slightly capitellate; basal cell tumid; terminal cell obtuse.

Long Island Pond, Falmouth, July, 1934 (*Croasdale*). Filaments scattered among many other filamentous algae. Type in C. C. Jao collections and Herb. Univ. Mich., *Woods Hole No. 136*.

These plants are characterized by their nannandrous habit, superior operculum, smooth spore-wall, swollen suffultory cell, and a tendency toward capitellate vegetative cells, showing that they are related to *Oe. hians* Nordstedt & Hirn. They differ, however, chiefly in having an idioandrosporous habit, a greater size, frequently long seriate oogonial chains, and the oospore usually not quite filling the oogonium.

10. Oedogonium oelandicum Wittrock & Hirn var. novae-angliae Jao. "Pasque J" Pond, Pasque Island, June 25, 1934 (*Jao*); "Endicott Hollow," Endicott Road, in Woods Hole, Aug. 8, 1934 (*Croasdale*).

11. Oedogonium platygynum Wittrock. "Sheep Pen Pond," Nonamesset Island, June 10, 1934 (*Jao and Croasdale*); "Deer Pond," Nonamesset Island, July 2, 1934 (*Croasdale*).

12. Oedogonium pratense Transeau. "Sheep Pen Pond," Nonamesset Island, June 19, 1934 (*Jao and Croasdale*).

14. Oedogonium reticulocostatum Jao. "Sheep Pen Pond," Nonamesset Island, June 19, 1934 (*Jao and Croasdale*); "Deer Pond," Nonamesset Island, July 2, 1934 (*Croasdale*).

14. **Oedogonium suborbiculare**, sp. nov. (Figs. 3, 4). Oedogonium dioicum, macrandrium; oogoniis 1- vel 10-continuis, subglobosis vel subellipsoidali-globosis, poro superiore apertis; oosporis globosis, interdum subglobosis, oogonia non vel fere complentibus, membrana triplici: episporio et endosporio laevibus; mesosporio scrobiculato, scrobiculationibus plus minusve concentricis et diametro variantibus; cellulis suffultoriis interdum tumidis parvis; antheridiis 1–3; spermatozoidiis binis, divisione horizontali; cellulis vegetativis plus

minusve capitellatis; cellula basali elongata; cellula terminali acuta, in filamentis femineis frequenter subtitutione oogonii nulla; filamentis masculis elongatis, ex cellulis vegetativis multis constantibus.

Cell. veg. plantae fem.	22–32 μ diam.,	112–218 μ long.
Cell. veg. plantae masc.	19–22 μ diam.,	130–210 μ long.
Oogonia (cum prolongatione)	64–74 μ diam.,	77–114 μ long.
Oosporae	54–67 μ diam.,	54– 67 μ long.
Antheridia	16–18 μ diam.,	13– 16 μ long.
Cell. basales	25–32 μ diam.,	166–180 μ long.
Cell. suffultoriae	22–38 μ diam.,	118–200 μ long.

Dioecious, macrandrous; oogonia 1–10, subglobose or ellipsoid-globose, pore superior; oospore globose, sometimes subglobose, not filling or nearly filling the oogonium, spore-wall of three layers: the outer and inner smooth, the median layer scrobiculate; scrobiculations more or less concentrically arranged and varying in diameter; suffultory cell sometimes slightly enlarged; antheridia 1–3; sperms 2, arising by horizontal division; vegetative cells more or less capitellate; basal cell elongate; terminal cell usually becoming an oogonium on fertile female filaments, but if sterile, acute; male filaments elongate, of many vegetative cells.

Lily Pond, Hatchville, between North and East Falmouth, Aug. 4, 1934 (*Croasdale*). Plants growing on water-grasses in company with *Bulbochaete Nordstedtii* Wittrock, etc. Type in C. C. Jao collections and Herb. Univ. Mich., *Woods Hole No. 130.*

This new species is distinguished from *Oe. Tiffanii* Ackley by the oogonium having a diameter always less than the length and by the larger vegetative cells, which are more or less capitellate in form. It also shows some characteristics of *Oe. scrobiculatum* Wittrock and *Oe. verrucosum* Hallas, but differs from the first chiefly in having a scrobiculate median spore-wall, from the second in having much better developed male filaments, not restricted to a holdfast cell and a few antheridial cells, and from both in having all cells of greater dimensions and vegetative cells more or less capitellate. The terminal oogonium of this new species generally extends into a long, acute process. The length of oogonia listed above includes the processes. If just the oogonia proper are considered, their length is 77–100 μ.

15. Oedogonium undulatum (Brebisson) Al. Braun f. senegalense (Nordstedt) Hirn (subforma). "Deer Pond," Nonamesset Island, July 2, 1934 (*Croasdale*).

II. BULBOCHAETE

1. Bulbochaete Brebissonii Kuetzing. Furber Pond, Naushon Island, July 7, 1933 (*Jao*); "Wall Pond," Nonamesset Island, July 5 and 17, 1933 (*Jao and Croasdale*); Freshwater Pond, Nobska, Woods Hole, July 21, 1933 (*Jao*).

2. Bulbochaete elatior Pringsheim. "Wood Pond," Ganset Road, in Woods Hole, June 23, 1933 (*Jao*).

3. Bulbochaete Furberae Collins. "Woods Pond," Ganset Road, in Woods Hole, June 23, 1933; Freshwater Pond, Nobska, Woods Hole, July 21, 1933 (*Jao*); "Wall Pond," Nonamesset Island, July 5, 1933 (*Jao and Croasdale*); Furber Pond, Naushon Island, July 7, 1933 (*Jao*); "Harper Pond," Whitman Road, Woods Hole, Aug. 27, 1933 (*Jao*).

4. Bulbochaete intermedia De Bary. "Sheep Pond," Cuttyhunk Island, 1922 (*Taylor*); July 27, 1933 (*Jao*).

5. Bulbochaete intermedia De Bary var. depressa Wittrock. "Sheep Pen Pond," Nonamesset Island, July 5, 1931 (*Croasdale*).

6. Bulbochaete mirabilis Wittrock. "On Fontinalis in a pond, Cuttyhunk Island, Gosnold, Massachusetts, July 11, 1907, in company with *B. intermedia* De Bary." Phycotheca Boreali-Americana, No. 1431.

7. Bulbochaete Nordstedtii Wittrock. Lily Pond, Hatchville, between North and East Falmouth, Aug. 4, 1934 (*Croasdale*).

8. Bulbochaete Nordstedtii Wittrock f. suberecta Collins. Fawn Pond, Nonamesset Island, June 18, 1933 (*Croasdale*).

9. **Bulbochaete praereticulata**, sp. nov. (Figs. 5–7). Bulbochaete dioica, nannandria, idioandrospora; oogoniis depresso-globosis vel raro depresso-oboviformi-globosis; patentibus, sub setis terminalibus; dissepimento cellularum suffultoriarum mediano; mesosporio reticulo-scrobiculato; androsporangiis 1–7; nannandribus quam oogoniis brevioribus, in oogoniis vel cellulis suffultoriis sedentibus; antheridiis exterioribus, stipite arcuato fere duplo longiore quam antheridio; cellulis vegetativi, praeter cellulas basales, androsporangiis et oogoniis spiraliter granulatis.

Cell. veg.	16–26 (–29) μ diam.,	48–93 μ long.
Oogonia	54–58 μ diam.,	41–54 μ long.
Oosporae	52–56 μ diam.,	40–52 μ long.
Androsporangia	16–19 μ diam.,	6–10 μ long.
Nannand. stipes	9–10 μ diam.,	32 μ long.
Antheridia	9–10 μ diam.,	13–16 μ long.

Dioecious, nannandrous, idioandrosporous; oogonia depressed-globose or rarely depressed obovoid-globose, patent, below terminal seta; division of suffultory cell median; outer wall of the spore reticulate-scrobiculate; androsporangia 1–7; dwarf males shorter than the oogonia, developed on oogonia or on suffultory cells; antheridia interior; stipe about twice as long as the antheridium, curved; vegetative cells, except the basal cells, oogonia and androsporangia spirally granulate.

Shanks Pond, Falmouth, Aug. 4, 1934 (*Croasdale*). Type in C. C. Jao collections and Herb. Univ. Mich., *Woods Hole No. 133.*

Of the known species of this genus, only *Bulbochaete gigantea* Pringsheim has the reticulate outer spore-wall. This new species

has some similar characteristics, but differs distinctly in having acutely granulate vegetative cells, androsporangia and oogonia, and in the smaller dimensions of all parts.

10. Bulbochaete pygmaea Pringsheim & Wittrock var. **erecta**, var. nov. (Figs. 8, 9). Bulbochaete dioica, nannandria, gynandrospora; filamentis abbreviatis, plerumque longitudine minus quam 10-cellularibus, simplicibus vel breviter ramosis, ramis 1- vel 2-cellularibus; oogoniis ellipsoideis, erectis, plerumque proximis ad cellulam basalem rarius terminalibus vel patentibus sub cellulis vegetativis vel setis; episporio longitudinaliter costato, costis fere 22, denticulatis, dentibus interse transverse costulatis; cellulis suffultoriis indivisis; androsporangiis sparsis, 1–2-cellularibus; nannandribus prope oogonia sedentibus; antheridiis exterioribus.

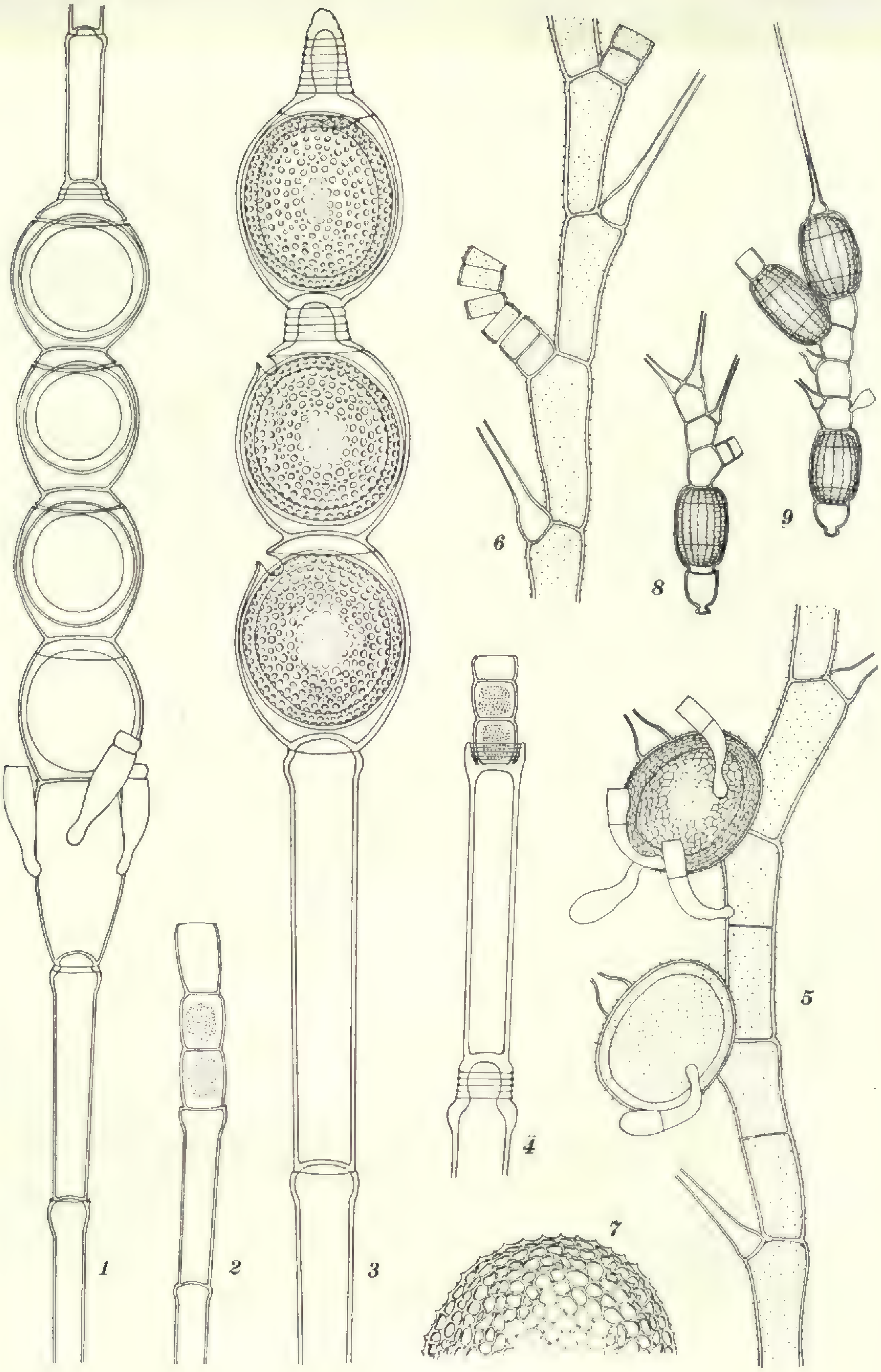
Cell. veg.	13–16 μ diam.,	10–16 μ long.
Oogonia	19–22 μ diam.,	29–38 μ long.
Oosporae	18–21 μ diam.,	28–35 μ long.
Androsporangia	10 μ diam.,	3 μ long.
Nannand. stipes	11 μ diam.,	16 μ long.
Cell. basales	13–16 μ diam.,	19–22 μ long.

Dioecious, nannandrous, gynandrosporous; filament short, usually less than ten cells long, unbranched or with 1- or 2-celled branches; oogonia ellipsoid, erect, usually next to the basal cell, very rarely terminal or patent below vegetative cells or setae; outer spore-wall longitudinally ribbed, ribs about 22 in number, dentate, the teeth united to each other by transverse ridges; suffultory cell without division; androsporangia scattered, 1–2; dwarf males near the oogonium; antheridium exterior.

Lily Pond, Hatchville, between North and East Falmouth, Aug. 4, 1934 (*Croasdale*). Epiphyte on *Bulbochaete Nordstedtii* Wittrock. Type in C. C. Jao collections and Her. Univ. Mich., *Woods Hole No. 130*.

This variety differs from the typical form in having the oogonia usually erect, in the smaller dimensions and in its very short filaments unbranched or with few very short branches. The author has compared this variety with typical *B. pygmaea* in F. S. Collins' specimens (Phycotheca Boreali-Americana No. 1683), and it appears quite different, especially in the position of the oogonia and the habit of the whole plant, for *B. pygmaea* has the oogonia regularly patent and the plant is longer and with more numerous branches.

11. Bulbochaete repanda Wittrock. Long Pond, Falmouth, July 15, 1900, Phycotheca Boreali-Americana, No. 814; "Sheep Pen Pond," Nonamesset Island, July 5, 1931 (*Croasdale*); Freshwater Pond, Nobska, Woods Hole, July 21, 1933 (*Jao*).



Jao del.

Figs. 1 and 2, Oedogonium hians var. megasporum; figs. 3 and 4, O. suborbiculare; figs. 5–7, Bulbochaete praereticulata; figs. 8 and 9, B. pygmaea var. erecta; figs. 1–6 and 8 and 9, × 303; fig. 7, × 652

EXPLANATION OF PLATE 407

FIGS. 1, 2. OEODOGNIUM HIANS Nordstedt & Hirn var. MEGASPORUM Jao, var. nov. FIG. 1, part of the female filament, with three mature oogonia and one young oogonium and three dwarf males on the swollen suffultory cell; FIG. 2, part of the androsporangial plant, with three androsporangia.

FIGS. 3, 4. OEDOGONIUM SUBORBICULARE Jao, sp. nov. FIG. 3, tip of the female filament, with three mature oogonia; FIG. 4, part of the male filament, showing three antheridia, two of which each contain two sperms formed by a transverse division.

FIGS. 5–7. BULBOCHAETE PRAERETICULATA Jao, sp. nov. FIG. 5, part of the female filament, with mature (upper) and young (lower) oogonia, and the dwarf males on both the suffultory cell and oogonia; FIG. 6, part of the androsporangial plant, showing two series of androsporangia; FIG. 7, part of the oospore, showing the reticulate outer spore-wall.

FIGS. 8, 9. BULBOCHAETE PYGMAEA Wittrock var. ERECTA Jao, var. nov. FIG. 8, a typical plant, the unbranched filament with an oogonium next to the basal cell and two androsporangia; FIG. 9, a less common plant, showing erect and patent oogonia and a dwarf male sitting on the vegetative cell near the oogonium.

FIGURE 7 was made with the camera lucida at a magnification of 1550 diameters, the others at 720 diameters, and they are reduced in reproduction to 652 diam. and 303 diam. respectively.

SOME FORMS IN THE ALISMACEAE

M. L. FERNALD

ECHINODORUS CORDIFOLIUS (L.) Griseb., forma **lanceolatus** (Engelm.), comb. nov. *E. rostratus*, var. *lanceolatus* Engelm. in Mackenz. & Bush, Man. Fl. Jackson Co. Mo. 10 (1902) in syn. *E. cordifolius*, var. *lanceolatus* (Engelm.) Mackenz. & Bush, l. c. (1902).

With no clearly defined range and differing only in its small and narrow leaves this is better treated as a form.

LOPHOTOCARPUS SPONGIOSUS (Engelm.) J. G. Sm., forma **laminatus**, n. f., foliis laminatis, laminis lanceolatis vel ovatis elobatis vel sagittatis.—Massachusetts to Virginia. TYPE: muddy places, Delaware City, DELAWARE, September 18, 1894, *A. Commons*, in Gray Herb.

LOPHOTOCARPUS CALYCINUS (Engelm.) J. G. Sm., forma **maximus** (Engelm.), comb. nov. *Sagittaria calycina*, var. *maxima* Engelm. in Torr. Bot. Mex. Bound. Surv. 212 (1858). *S. calycinus*, var. *grandis* Engelm. in Gray, Man. ed. 5: 493, 494 (1867). *L. calycinus*, var. *maximus* (Engelm.) Robinson in RHODORA, x. 31. (1908).

This and the next seem to be a very robust and a very depauperate form rather than true varieties.

LOPHOTOCARPUS CALYCINUS (Engelm.) J. G. Sm., forma **depauperatus** (Engelm.), comb. nov. *Sagittaria calycina*, var. *depauperata* Engelm. in J. G. Sm. Lophot. U. S. 4, in syn. (1899). *L. depauperatus* (Engelm.) J. G. Sm. l. c. (1899).

SAGITTARIA RIGIDA Pursh, forma **fluitans** (Engelm.), comb. nov. *S. heterophylla*, var. *fluitans* Engelm. in Gray, Man. ed. 2: 439 (1856).

S. rigida, forma **elliptica** (Engelm.), comb. nov. *S. heterophylla*, var. *elliptica* Engelm. l. c. (1856).

Sagittaria Engelmanniana J. G. Sm., forma **dilatata**, n. f., a forma typica recedit laminis ovatis vel deltoideis.—Range of the species, much less common. The following belong here. Massachusetts: peaty margin of Goodenough Pond, Yarmouth, September 19, 1913, *Fernald & Long* no. 8466 (type in herb. N. E. Bot. Club). Rhode Island: boggy pond-margin, northeast of Woodville, August 30, 1919, *Fernald & Collins;* boggy margin of Tippecan Pond, Exeter, September 22, 1920, *Graves & Woodward.* Connecticut: bog south of Poquonnoc Lake, Groton, September 14, 1905, *Graves.* New York: swampy pine-barren thicket, Ronkonkoma, Long Isl., September 25, 1922, *W. C. Ferguson.* New Jersey: quagmire near Deer Pond, Atco, September 26, 1921, *Meredith.*

Sagittaria cuneata Sheldon, forma **hemicycla**, n. f., a forma typica recedit foliis ovatis apice rotundatis.—Occasional through the range; type: rocky tidal shore of St. Lawrence River, St. Augustin, Co. Portneuf, Quebec, August 7, 1923, *Svenson & Fassett,* no. 1063 (Gray Herb.).

S. cuneata, forma **equiloba,** n. f., a forma typica recedit lobis basilaribus plus minusve divergentibus lobum terminalem aequantibus vel subaequantibus acutis.—Occasional throughout the range; type: Isle Royale, Michigan, August 25, 1910, *Cooper,* no. 290 (Gray Herb.).

Rogers's "Tree Flowers of Forest, Park, and Street."[1]—Professor Rogers has produced a new kind of tree book. As a compendium of information, it is no rival of such works as Hough's, nor does it pretend to be. But it does fill a neglected field—that of adequate, large-scale, photographic illustration of the tiny and inconspicuous, but often morphologically significant, flowers of many woody species. The only precedent for it which comes to mind—and that a partial one—is to be found in the views of enlarged sori in C. E. Waters's "Ferns." Prof. Rogers's photographs, done by a special technique of his devising, attracted much favorable comment when they were exhibited at various botanical institutions some two years ago. They are now made available to the public, in fine half-tone reproduction, in the present exceptionally well printed and handsome volume.

About 85 species are illustrated. Rarely, as in the elm samara shown, the effect is rather foggy; and one could wish that the dissecting-needles on which many flowers are very obviously impaled might have been painted out of the negatives. But for the most part the plates are in every way admirable. Each is accompanied by a few paragraphs of informal descriptive and explanatory text, set in a small block in the middle of the page. The wide margins thus left are utilized for silhouette drawings of some distinctive feature of the species concerned—fruit, leaves, leaf-scars, buds and the like. These are further supplemented by

[1] Rogers, Walter E. Tree Flowers of Forest, Park, and Street. Published by the Author, Appleton, Wisconsin. 1935. (13) + 500 pp. Illustrated from photographs by the author and drawings by Olga A. Smith.

habit-silhouettes of the whole plant, in the case of deciduous-leaved species in winter condition. These fulfill well and accurately and with a vividness and esthetic appeal which photographs could hardly achieve, their stated purpose of portraying the characteristic architecture of species—least successfully, perhaps, in the conifers.

It is hard to say whether this book should interest the artist or the botanist more. Certainly the former can get from it many hints as to design; and for the latter, the plates show the morphology of many flowers so clearly and fully as to be a real and welcome addition to his working material.—C. A. W.

A NEW COLUMBINE FROM THE EDWARDS PLATEAU OF TEXAS

V. L. Cory

Up till the month of May, 1934, the writer was unaware that a native columbine could be found on the Edwards Plateau of Texas. When found it was in a place not readily accessible to goats and sheep, both of which are pastured in these timbered hills along the Frio River, or to deer that even to the present time range there in more or less abundance. This columbine is rare, for but three plants were noted in the locality of collection, which was on a shelving slope of limestone at the base of a limestone cliff on the Frio River at some distance above the town of Leakey in Real County. These plants were growing in small, somewhat circular, relatively deep holes or pockets in solid limestone, which is kept more or less wet by seepy springs. One plant was left untouched, and it was not possible to get the roots of the other two plants out from their rocky pits. The plants should continue to grow and reproduce and escape observation for the most part, as heretofore.

Aquilegia **phoenicantha,** sp. nov., perennis herbacea, rhizomate lignoso; caule striato quadrangulato inferne sparse piloso superne glabro; foliis circumscriptione orbicularibus diametro 4–5 cm. triternatis supra viridibus infra glaucis, foliolis cuneato-ovatis profunde trilobatis laciniis leviter lobatis apice rotundatis truncatisve, venis prominentibus; pedunculis gracilibus 6–8 mm. longis; floribus solitariis erectis, sepalis 10–13 mm. longis elliptico-ovatis abrupte acuminatis rubescenti-purpureis unguiculatis, ungui 3 mm. longo, calcare recto rubescenti-purpureo 22–25 mm. longo anguste infundibuliformi, infra labellum 6 mm. diametro supra nectarium 1 mm.; petalorum labello 5–6 mm. longo intus flavo, extus apicem truncatum vel leviter rotundatum versus flavo alibi rubescenti-purpureo; staminibus multis plerumque ultra 10 mm. longis petala valde superantibus; folliculis erectis 15–17 mm. longis, in caudam gracillimam

glabram 1 cm. vel ultra maturitate recurvatam sensim angustatis; seminibus multis circa 1.5 mm. longis 1 mm. latis cymbiformibus vel triangulatis dorso rotundatis laevibus.

Aquilegia **phoenicantha,** new species. Plant herbaceous, perennial from a woody root; stem striate, 4-angled, sparsely pilose below, glabrous above; leaves triternately compound, orbicular in outline, 4–5 cm. in diameter, prominently veined, bright green above and glaucous below; leaflets cuneate-ovate, deeply 3-lobed, segments shallowly lobed, the apices rounded or truncate; flowers solitary, erect, on slender peduncles 6–8 mm. long; sepals 10–13 mm. long, elliptic-ovate, abruptly acuminate, reddish-purple, with a claw 3 mm. long; spurs straight, prominently knobbed at the end, reddish-purple, tapering from 1 mm. broad above the knob to 6 mm. broad below the projecting lip, 22–25 mm. long; projecting lip of petals 5–6 mm. long, yellow on the inside and yellow at the apex outside but changing to reddish-purple at 3 mm. below the apex, which is truncate or slightly rounded; stamens numerous, mostly exceeding 10 mm. in height, and exserted above the petals to as much as 10 mm.; follicles erect, 15–17 mm. long, tapering gradually into a very slender, glabrous tail, which is 1 cm. or more long and mostly recurved at maturity; seeds numerous, about 1.5 mm. long and 1 mm. broad, boat-shaped or 3-angled and rounded on the back, smooth.

Specimen No. 8504 is designated as the type, and the same is deposited at the Gray Herbarium. It was collected on the Frio River in Real County, May 11, 1934. It shows both the flower and the fruit. The other native columbines of Texas occur in the mountains some 200 miles to the west.

Texas Agricultural Experiment Station,
Sonora, Texas.

A Smooth-husked Hazel.—The Beaked Hazel, *Corylus cornuta* Marsh. (*C. rostrata* Ait.) furnishes one of the best of wild nuts, comparable with the Old World filbert. It has a great disadvantage for the nut-gatherer in its prolonged and excessively bristly involucre. In late August, 1915, Mr. H. B. Jackson and I found a considerable thicket, heavily fruited, with the involucres essentially glabrous. This form, which, crossed with the filbert, might yield a desirable crop for northern latitudes, may be called

Corylus cornuta Marsh., forma **inermis,** forma nova, involucris glabris vel vix setulosis.—Quebec: abundant in border of woods, East Broughton, August 28, 1915, *Fernald & Jackson,* no. 12,073 (type in Gray Herb.)—M. L. Fernald.

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Vol. 38. March, 1936. No. 447.

A STUDY OF FIVE NEW ENGLAND SPECIES OF SCAPANIA[1]

Alexander W. Evans

The writer in 1930 discussed "three species of *Scapania* from western North America" (**6**) from the standpoint of the ideas expressed in Buch's recent monograph on the Scapaniaceae of northern Europe and Siberia (**4**). The same method is employed in the present paper, which considers five species of *Scapania* from New England. The species in question are *S. gymnostomophila, S. apiculata, S. curta, S. mucronata,* and *S. lingulata.* These species are by no means confined to New England but have an extensive distribution, for the most part circumboreal.

The family Scapaniaceae, as defined by Buch (**4,** p. 10), includes the following genera: *Douinia* Buch, *Diplophyllum* Dumort., *Scapaniella* Buch, *Scapania* Dumort., and *Blepharidophyllum* Ångstr. Of these genera *Douinia,* with the single species *D. ovata* (Dicks.) Buch, is confined in North America to the Pacific Coast region, and *Blepharidophyllum* is distinctly antarctic. The other three genera are all found in New England. The distinctions between *Scapania* and *Scapaniella,* represented in North America by *S. glaucocephala* (Tayl.) Evans, will be commented upon by the writer in another connection. Those between *Diplophyllum* and *Scapania* may now be briefly reviewed.

In most recent works on the Hepaticae the main distinctions between these genera are drawn from the perianth. This organ, in typical species of *Scapania,* is strongly compressed, with sharp lateral

[1] Contribution from the Osborn Botanical Laboratory.

keels; the dorsal and ventral surfaces, moreover, lack supplementary folds, and the mouth is not contracted. In *Diplophyllum,* on the other hand, the perianth is less strongly compressed and is bounded laterally by rounded folds, additional dorsal and ventral folds are present (at least in the upper part), and the mouth is distinctly contracted. In Buch's monograph the main distinctions between these two genera are drawn from the leaves. In typical *Scapaniae* these are keeled throughout; in other words the two lobes meet at a definite angle, which is most clearly shown by cross-sections. In *Diplophyllum,* however, the leaves, although keeled above, are not keeled below, and a cross-section shows a broad open curve. The unkeeled portion extends about half-way to the sinus between the lobes and forms a more or less distinct sheath around the stem.

In most of the species belonging to the genera in question the *Scapania* type of leaf is associated with the *Scapania* type of perianth and the *Diplophyllum* type of leaf with the *Diplophyllum* type of perianth. There are a few species, however, in which the *Scapania* type of leaf is associated with the *Diplophyllum* type of perianth, and these have sometimes been referred to *Scapania* and sometimes to *Diplophyllum.* Buch refers all such species to *Scapania* but separates them subgenerically from the more typical members of the genus. The only New England species falling into this doubtful category is *S. gymnostomophila,* for which Buch proposes the new subgenus *Kaalaasia,* named in honor of B. Kaalaas, the author of the species. All the other species of *Scapania* found in New England are referable to his subgenus *Euscapania.*

One of the most noteworthy features of Buch's work on *Scapania* (**3**) is his use of pure culture methods. By cultivating certain species under varying conditions of light and water-supply he has been able to show that marked differences in the appearance and structure of the plants may be directly due to differences in these external factors. Many types of *Scapaniae,* which represent such responses to the environment, occur in nature, and some of these have been distinguished in the literature, sometimes as forms, sometimes as varieties, and sometimes even as distinct species. Buch, however, would apply the term "modification" to all such environmental fluctuations and would not regard them as definite taxonomic entities. He would reserve the terms form, variety, and species for types transmitted by heredity and therefore essentially different from environmental responses. As examples of his modifications, which are more or less

alike in different species, it will be sufficient to mention "mod. *viridis*," with leaf-cells having colorless cells-walls, caused by diffuse light; "mod. *colorata*," with leaf-cells having pigmented cell-walls, caused by exposure to direct sunlight; "mod. *leptoderma*," with thin-walled leaf-cells, caused by a complete (or almost complete) absence of transpiration; and "mod. *pachyderma*," with thick-walled leaf-cells, caused by excessive transpiration.

Buch's work emphasizes further the importance of certain histological features of the stem and leaves in distinguishing species. In the stem, as seen in cross-section, a small-celled cortex, varying in different species from one to five cells in thickness, and a large-celled medulla can be distinguished. The cells of the cortex may be thin-walled or thick-walled, according to the environment, and any deposits of thickening lining the cell-cavities are more or less uniform. The cells of the medulla are usually thin-walled throughout but occasionally show minute thickenings at the angles. In the leaves a marginal band, one or more cells wide, is characteristic of certain species. The cells of this band, in its most usual development, have uniformly thickened walls and thus stand in contrast to the interior cells, which have localized thickenings at the angles. Unfortunately bands of this character, although distinctive of certain species, are not necessarily of constant occurrence. In the variable *S. undulata* (L.) Dumort., for example, well-marked bands are present in mod. *pachyderma*, but in the submerged and more usual mod. *leptoderma* the leaf-cells are thin-walled throughout.

Of the cell-contents Buch emphasizes the importance of the fat-bodies from the standpoint of the taxonomist and notes that their development is but little influenced by external factors. The fat-bodies, when different species are compared, show differences in size, in color, and in the number present in each cell. In most cases fresh material is necessary for their study, since they tend to disintegrate after death and often disappear completely. In a few species, however, they are more persistent and can be demonstrated even in old herbarium specimens.

The five species to be discussed are among the smallest members of the genus. As already noted Buch places *S. gymnostomophila* in the subgenus *Kaalaasia* and the other four species in the subgenus *Euscapania*. Of these four species *S. apiculata* is referable to Buch's section *Apiculatae*, and *S. curta*, *S. mucronata* and *S. lingulata* to his section *Curtae*. Eight additional species of *Scapania* have been found

in New England, and these illustrate four of Buch's other sections of *Euscapania*.

1. Scapania gymnostomophila Kaalaas, Bot. Not. **1896**: 21. *Diplophyllum gymnostomophilum* Kaalaas, Vidensk.-Skrift. I. **1898**[9]: 4–9. *f. 1–4.*

In calcareous regions, mostly on limestone cliffs in association with other bryophytes.

Maine: Round Mountain Lake and vicinity, Franklin County, 1916 (*Miss Lorenz*), listed in Rhodora **19**: 272. 1917, as *Diplophyllum gymnostomophilum.*

Vermont: Rochester, 1910 (*Dutton*), determined by Buch, listed in Rhodora **14**: 224. 1912, as *Scapania curta;* Willoughby, 1913 (*Miss Lorenz*), listed in Rhodora **16**: 72. 1914, as *Diplophyllum gymnostomophilum;* same locality, 1917 (*Miss Lorenz*); Smuggler's Notch, 1917 (*Miss Lorenz*); Quechee Gulf, Hartford, 1921 (*Miss Lorenz*).

The following North American stations outside New England may also be cited:— Ellesmere Land: Havnefjord and Isachsens Fjord, King Oscar Land, 1898–1902 (*Simmons*), listed by Bryhn in Report Second Norwegian Expedition in the "Fram" **11**: 47. 1906, as *Diplophyllum gymnostomophilum.* Nova Scotia: Middle Harbor, Dingwall, 1917 (*Nichols*). Wisconsin: Black River, Douglas County, no date (*Conklin*). The species is widely distributed in northern and central Europe and also in Siberia.

The writer (**6**, p. 71) has already called attention to some of the more important features of this interesting species and to the divergent views which have been held regarding its systematic position. As already noted Buch places it in *Scapania*, rather than in *Diplophyllum*, because its leaves do not conform to the *Diplophyllum* type. The monotypic subgenus *Kaalaasia*, which he proposes for its reception, is characterized not only by its plicate perianth but also by its small dorsal lobes, which rarely extend to the upper margin of the ventral lobes; and by its peculiar fat-bodies, which are brownish and unusually large for the genus. In most cases these fat-bodies occur singly in the leaf-cells and occupy the greater part of the cell-cavity. It is only along the margin, toward the bases of the lobes, and in the apical portions of gemmiparous leaves that they are sometimes found in pairs or clusters. The fat-bodies persist for a long time in herbarium specimens but eventually disappear.

Buch emphasizes also, as a subgeneric character, the entire margins of the leaves and states that this condition prevails even in the case of gemmiparous leaves. In the subgenus *Euscapania*, on the other hand, many of the species have toothed leaves, and even those in

which the lobes are normally entire tend to develop teeth on the leaves of gemmiparous branches. Apparently, however, Buch lays undue emphasis on this particular difference, since the leaves of *S. gymnostomophila* are not invariably entire. In the writer's experience minute denticulations, each consisting of a single projecting cell, are occasionally produced and seem to be associated in some way with the production of gemmae. These denticulations, which have been observed in both European and American material, may have thin walls, but in other cases their walls are thickened and thus resemble the outer walls of ordinary marginal cells. Although in most of the plants examined an individual leaf rarely produces more than one or two denticulations, some of the leaves in the Nova Scotia plants produce from four to eight.

The leaf-lobes in *Kaalaasia* are usually pointed, although the ventral lobe in some cases is rounded. The point consists of a single cell or in rare instances of two cells, and the outer wall is either thin or thickened, thus resembling the outer walls of the marginal denticulations. Buch describes the leaf-cells as everywhere "collenchymatous." The trigones, however, as shown by his figures, usually have concave sides and may be minute and indistinct. According to Kaalaas (**8**, p. 5) the cortex of the stem is composed of two or three layers of cells with thickened brownish walls. According to Buch the cortex consists of a single layer of flattened cells with uniformly thickened walls, which are distinctly smaller than the medullary cells, with the possible exception of those adjacent to the cortex. The discrepancy in these two accounts may be due to the fact that the walls of two or three of the outer medullary layers frequently show a brownish pigmentation.

The perianths of *S. gymnostomophila* are exceedingly rare, and very few have been observed. Kaalaas emphasizes the plicate feature and states that the mouth is contracted and finely dentate. A few of the specimens from Wisconsin show badly weathered perianths, agreeing in most respects with the published descriptions but showing short-ciliate, rather than dentate, mouths. According to Buch plicate perianths can occasionally be found in the section *Curtae* of the subgenus *Euscapania*, although in most species of this group the perianths definitely conform to the *Scapania* type. He thinks, therefore, that Kaalaas attached too much importance to this feature when he excluded *S. gymnostomophila* from *Scapania*.

The golden-brown, two-celled gemmae of *S. gymnostomophila*, with their thickened walls, are very helpful in distinguishing the species.

In most cases they are distinctly pointed at both ends and commonly show a fusiform outline, although deviations from this form are to be expected. In *S. curta* and its allies, with which the present species has sometimes been confused, the gemmae are usually green, except where exposure to direct sunlight produces a reddish pigmentation.

2. Scapania apiculata Spruce, Hepat. Pyrenaicae Exsic. 15. 1847; Ann. & Mag. Nat. Hist. II. **4**: 106. 1849.

On logs, often associated with other bryophytes.

Maine: Round Mountain, Franklin County, 1912 (*Miss Lorenz*), listed in Rhodora **14**: 224. 1912; Caribou, 1913 (*A. W. E.*); Megantic Preserve, Franklin County, 1916 (*Miss Lorenz*).

New Hampshire: Chocorua, 1906 (*Farlow*), listed in Rhodora **9**: 71. 1907; Flume and Franconia Notch, 1908 (*Miss Lorenz et al.*), listed by Miss Lorenz in Bryologist **11**: 114. 1908; Waterville, 1911 (*A. W. E.*); King's Ravine, Randolph, and Columbia, 1917 (*A. W. E.*).

The following North American stations outside New England may also be cited:—Manitoba: Manitoba House, 1881 (*Macoun*), listed in Rhodora **9**: 71. 1907. New York: North Elba, 1898 (*Peck*), listed by Peck in Bul. N. Y. State Mus. **6**: 178. 1899. Wisconsin: St. Louis Bay, Superior, 1905 (*Conklin*); Copper Creek, 1909 (*Conklin*); Wentworth, Douglas County, 1910 (*Conklin*); Stone's Bridge, Brule River, Douglas County, 1916 (*Conklin*). Minnesota: Spirit Lake, Duluth, 1907 (*Conklin*); Lutsen, Cook County, 1911 (*Conklin*). The specimens from Wisconsin and Minnesota, collected prior to 1914, have been listed by Conklin in Trans. Wisconsin Acad. **18**: 1004, 1005. 1914. So far as known *S. apiculata* is confined to old logs. It has a wide distribution in Europe and northern Asia, although far from abundant throughout the greater part of its range.

The writer has already published a short account of this distinct species (**5**, p. 71); but a summary of its more important features, including certain peculiarities brought out for the first time in Buch's description, may be of interest. The stem, as in all the *Scapaniae*, shows a differentiation into a cortex composed of small thick-walled cells and a medulla composed of larger thin-walled cells. The cortical cells, which are in one or two layers, are strongly flattened, much as in *S. gymnostomophila*, and their walls are pigmented with brown. According to Buch's measurements these cells are only 7–13 μ in radial width and thus stand in sharp contrast to the medullary cells, which are 27–43 μ in diameter.

Other distinctive features of *S. apiculata* are found in the leaves and in the mouth of the perianth. In the leaves both lobes are sharp-pointed, and the points consist either of a single cell or of a cell-row two or three cells long. The dorsal lobe is somewhat smaller

than the ventral and, in some cases, spreads away from it in a squarrose manner. The margins are usually entire but occasionally show one or two indistinct teeth. The leaf-cells are characterized by their large and conspicuous trigones, which are present even in the marginal cells, and by their verruculose or striolate-verruculose cuticle. The trigones in most cases have convex sides and may be coalescent. In each leaf-cell two to six fat-bodies are present and may persist even in herbarium material. These fat-bodies are much smaller than those of *S. gymnostomophila* and present a granular appearance. The mouth of the perianth is normally entire, although in rare instances a marginal cell may project as a vague crenulation or denticulation.

Other characters of importance are derived from the gemmiparous leaves and branches. Buch was the first to show that these structures are highly specialized. The leaves, for example, toward the tip of the branch become gradually rounder, and their lobes become gradually shorter until the sinus between them completely disappears. These leaves, instead of being keeled, are closely appressed to the axis; and the gemmiparous branches, the growth of which is sooner or later limited, thus acquire a flagelliform appearance. The unicellular gemmae of *S. apiculata* are brown in color and broadly elliptical in form. Flagelliform branches of the type just described, with specialized gemmiparous leaves, are apparently confined, in *Scapania,* to the section *Apiculatae.* Similar branches are found, however, in two species of the allied genus *Scapaniella:* the European *S. vexata* (Massal.) Buch and the North American *S. glaucocephala.*

3. Scapania curta (Mart.) Dumort. Recueil d'Obs. sur les Jung. 14. 1835. *Jungermannia curta* Mart. Fl. Crypt. Erlangensis 148. *pl. 4, f. 24.* 1817. *J. rosacea* Corda in Sturm, Deutschl. Fl. II. **23**: 96. *pl. 29.* 1832. *Scapania rosacea* Nees in G. L. & N. Syn. Hep. 71. 1844.

On soil, sometimes in exposed localities and often accompanied by other bryophytes. Most of the records for *S. curta* and the two following species are based on Buch's determinations.

Maine: St. John River, between St. John Pond and mouth of the Allegash River, 1917 (*Nichols*); determination somewhat doubtful, In his monograph (**4**, p. 61) Buch lists two specimens from Maine. without giving more definite data.

New Hampshire: shore of Peabody River, near Gorham, 1897 (*Farlow*); Jackson, 1902 (*A. W. E.*). Both of these stations are listed in Rhodora **4**: 212. 1902.

The following stations from other parts of North America may likewise be listed:—British Columbia: Asulkan Valley, 1908 (*Brink-*

man). Wisconsin: near Cornucopia, Bayfield County, 1907 (*Conklin*). California: Tuolumne Meadows, 1928 (*Mrs. Sutliffe*): Yosemite Park, 1928 (*Mrs. Sutliffe*). Buch lists the species also from Minnesota, but there are no specimens from the state in the Yale Herbarium. In Europe and northern Asia *S. curta* is widely distributed.

In the section *Curtae*, as defined by Buch, the relatively small plants vary in color from green to brownish or reddish. In the stems the difference in size between the cortical and medullary cells is less pronounced than in the *Apiculatae*. The cortex is composed of one or two layers of cells with thick walls usually pigmented with brown, but the cells are scarcely flattened and usually appear isodiametric in cross-section. The leaf-lobes are rounded or abruptly short-pointed at the apex, and neither lobe arches across the stem. The production of gemmae, which are usually developed in abundance, tends to inhibit the growth of the gemmiparous leaves, but the gemmiparous branches do not acquire a flagelliform appearance.

The *Curtae* have been the cause of much confusion to hepaticologists, and divergent views have been held regarding the identity of *S. curta* and its range of variation. In 1916 Buch (**2**) emphasized the fact that the leaves of the species, as understood by most authors, showed two distinct types of cell-structure. In the first type one or more rows of marginal cells have uniformly thickened walls, whereas the interior cells have trigones; in the second type all the cells, including the marginal, have trigones. Buch decided that the species was too broadly defined and that it might better be treated as a group of related species. In carrying out this idea he segregated *S. mucronata* and *S. lingulata* from the old *S. curta* as new species. Buch, however, was not the first to distinguish the two types of cell-structure in the leaves of *S. curta*. This had already been done by Lindberg as early as 1889 (**9**, p. 31). Lindberg, in fact, had divided *S. curta*, as ordinarily understood, into two species on the basis of this distinction. Plants showing the first type he referred to *Martinellia rosacea* (Corda) Lindb. & Arnell and retained the name *M. curta* (Mart.) Lindb. & Arnell for plants showing the second type. From the study of the specimens in the Lindberg Herbarium Buch concluded that Lindberg's *M. rosacea* really represented the true *Scapania curta* and that his *M. curta* included *S. mucronata*, *S. lingulata* and several other species (see **4**, p. 55).

Buch divides the section *Curtae* into the two subsections *Marginatae* and *Immarginatae*. The first of these, which includes *S. curta* as now

restricted, is based on plants having leaves with a border, in other words on leaves showing the first type of cell-structure; the second, which includes *S. mucronata* and *S. lingulata,* on plants having leaves with the second type of cell-structure. The border in *S. curta,* as he describes it, is one to four cells wide. On the outside the cell-walls are uniformly thickened but toward the inside the boundary of the border is vague, owing to the insensible gradation between the cells with uniformly thickened walls and the interior cells with trigones separated by thin cell-walls.

Aside from the bordered leaves *S. curta* is characterized by the rounded to subacute apices of the lobes, which are either entire or sparingly and irregularly toothed; by the denticulate mouth of the perianth with teeth one to three cells long; and by the green, two-celled, elliptical gemmae. The plants are usually green but may assume a reddish or brownish color in direct sunlight. The cortex is green in shaded localities but sometimes shows a reddish pigmentation even when the leaves remain green. In extreme cases the cortex becomes dark reddish brown. The trigones of the leaf-cells in the interior of the lobes have straight or slightly convex sides, but the cavities never present a stellate appearance.

The species is exceedingly variable and readily responds to changes in the environment. In mod. *mesoderma* and mod. *pachyderma* the leaf-borders are distinct, but in mod. *leptoderma* the borders may not be differentiated at all. This modification often occurs in plants with small and distant leaves, constituting mod. *parvifolia-leptoderma-laxifolia* of Buch; and similar modifications may arise in *Scapania irrigua* (Nees) Dumort., which resemble those of *S. curta* very markedly. It is often difficult, in fact, especially in dried material, to determine these leptodermous modifications positively.

4. Scapania mucronata Buch, Medd. Soc. F. et Fl. Fenn. **42**: 91. *f. 6, 9.* 1916; Comm. Biol. Soc. Sci. Fenn. **3**[1]: 63. *f. 14.* 1928. *Martinellia mucronata* Arnell & Jensen, Svensk Bot. Tidskr. **12**: 309. 1918.

On soil, decayed logs, or shaded rocks, often accompanied by other bryophytes.

Maine: Eastport, 1911 (*A. W. E.*); Fort Kent, 1913 (*A. W. E.*).

New Hampshire: Jackson, 1890 and 1898 (*A. W. E.*).

Massachusetts: Mt. Holyoke, 1903 (*Miss Lorenz*), listed as *S. curta* in Rhodora **6**: 190. 1904.

Connecticut: shore of Black Pond, Meriden, 1907 (*Miss Lorenz*), listed as *S. curta* in Rhodora **10**: 192. 1908; Mt. Carmel, Hamden, 1913 (*Miss Lorenz*); Killingly, 1926 (*Miss Lorenz*).

Buch, in his Monograph, cites the species from Vermont, but there are no specimens from this state in the Yale Herbarium.

The following stations from various other parts of North America may also be cited:—Greenland: Upernavik, 1834 (*Vahl*), cited by Buch; Manetsok, no date (*Warming & Holm*), also cited by Buch. Alaska: Yakutat Bay, 1899 (*Brewer & Coe*), listed as *S. curta* in Proc. Washington Acad. **2**: 312. 1900. Yukon: Hunker Creek, 1902 (*Macoun*), listed as *S. curta* in Ottawa Nat. **17**: 23. 1903. Nova Scotia: Aspy Bay, 1917 (*Nichols*), listed by Nichols as *S. curta* in Bryologist **21**: 28. 1918. British Columbia: Tetachuk, 1911 (*Brinkman*), listed by Arnell as *Martinellia curta* in Göteborgs Kungl. Vetenskaps- och Vitterhets-Samhälles Handl. 23. 1922. New York: island in Chilson Lake, 1901 (*Mrs. Smith*). Michigan: shore of Douglas Lake, 1920 and 1921 (*Nichols*), listed by Nichols as *S. curta* in Bryologist **25**: 47. 1922; Grand Island, Alger County, 1934 (*Nichols*), listed by Nichols in Bryologist **38**: 15. 1935. Wisconsin: Black River, Douglas County, 1909 (*Conklin*); Bayfield County, Lake Superior, 1924 (*Conklin & Wilson*). Minnesota: Chester Creek Park, Duluth, 1909 (*Conklin*), distributed as *S. curta* by C. C. Haynes, Amer. Hepat. 75; Knife River, 1909; Carlton, 1909 and 1911; Lutsen, Cook County, 1911; Thompson, 1911; Thompson Gorge, St. Louis River Dells, Carlton County, 1924. Oregon: Pigeon Point, 1931 (*Miss Sanborn*), listed by Brinkman in Rept. Prov. Mus. Nat. Hist. [Victoria, B. C.] 1934: 14. The specimens from Minnesota were all collected by Conklin; several of these specimens, together with the first specimen from Wisconsin, are listed as *S. curta* by Conklin in Trans. Wisconsin Acad. **17**: 1005. 1914. The species is widely distributed in Europe and northern Asia.

It will be seen from the specimens cited that many of the North American records for *S. curta* have been transferred to *S. mucronata*. In view of the wide range of variation hitherto assigned to *S. curta*, it is obvious that published records for the species ought not to be accepted without a re-examination of the specimens upon which they were based.

When Buch proposed *S. mucronata* as a new species he described the trigones of the leaf-cells as unusually large and stated that the cell-cavities, in consequence, were distinctly stellate. Arnell, in recognizing the validity of *S. mucronata* (**1**, p. 29), under the name *Martinellia mucronata*, took exception to this statement. According to his account the cell-cavities, in many cases, are rounded, and the trigones are not especially large. In his monograph (**4**, p. 66) Buch admits the force of Arnell's criticism and finds that the cavities are rounded in the relatively frequent mod. *mesoderma*. He states, however, that stellate cavities are present in the relatively rare mod. *pachyderma*, which grows almost exclusively on rotten logs. All the

North American specimens examined by the writer show trigones clearly, even in the marginal leaf-cells. In some cases the sides of the trigones are definitely convex and project slightly into the cell-cavities, thus producing a somewhat stellate appearance; but this appearance is unusual, since most of the trigones observed have straight or slightly concave sides. These specimens, therefore, for the most part, represent mod. *leptoderma*.

In distinguishing *S. mucronata* from the other representatives of the *Immarginatae* Buch emphasizes the following features: the relatively small size of the marginal leaf-cells, which measure only 13–20 μ in width; the usual absence of teeth along the margins; the obovate ventral lobes, usually rounded with a sharp apical tooth, but sometimes more gradually pointed; the presence of an apical tooth on the dorsal lobes; the lobed and fimbriate mouth of the perianth, which may be either plicate or wholly destitute of supplementary folds; the elliptical, oval, or narrowly triangular, two-celled gemmae, varying in color from green to reddish.

The apical teeth of the lobes, according to his account, consist of a row one to three cells long, and he implies that these teeth are constantly present. In the European material examined by the writer this seems to be literally the case, except in very rare instances, although some of the one-celled teeth project very slightly. In several of the North American specimens, however, the ventral lobes, to a greater or less extent, are broadly rounded at the apex and show no signs of apical teeth. This might indicate that *S. mucronata* was more variable than the descriptions imply or that the specimens in question were incorrectly determined.

At first thought the closely related *S. scandica* (Arnell & Buch) Macvicar (see Buch, **4**, p. 73) comes to mind. This species, which is widely distributed in Europe, is known also from Iceland and Greenland and is therefore to be expected in continental North America. It agrees with *S. mucronata* in several important respects but differs in its usually rounded ventral lobes, in the smaller trigones of its leaf-cells, and in the entire or very sparingly denticulate mouth of its perianth. Unfortunately the North American specimens with rounded lobes are mostly sterile. A single perianth, however, was detected in the material from Mt. Carmel, Connecticut, in which rounded ventral lobes are much in evidence, and this perianth is distinctly fimbriate at the mouth. This particular material, therefore, cannot be referred to *S. scandica*, and it seems best to retain it in *S. mucronata*, at least

until the range of variation in this species is better understood. The sterile specimens with rounded ventral lobes are likewise retained in *S. mucronata,* since they agree in all essential respects with the Mt. Carmel specimens.

Arnell, in his study of European and Siberian material, apparently met with similar difficulties (**1**, p. 30). In assigning a long series of specimens to *Martinellia mucronata* he states that he is not quite convinced that all of these specimens belong to one and the same species, since the material is not homogeneous. He prophesies, in fact, that the very critical *curta*-group may show itself unexpectedly rich in distinguishable species. The time is hardly ripe, however, to make further segregations, and a supposed new species in the group should be subjected to careful culture-methods before it is definitely proposed.

Attention has already been called to mod. *leptoderma* of *S. curta,* in which the distinctive leaf-borders of the *Curtae* are not differentiated. The mod. *parvifolia-laxifolia,* with which the leptodermous condition is often associated, represents, according to Buch (**3**,) a direct response to a diminished light supply, which casuses a lengthening of the internodes and, as a result, the separation of the leaves. In *S. mucronata, S. scandica,* and *S. lingulata,* however, a diminished light supply has little or no effect on the length of the internodes, although it does cause a diminution in the size of the leaves. These species, therefore may occur as mod. *parvifolia-densifolia* but not as mod. *parvifolia-laxifolia.* On account of these differences in response, which are to be regarded as specific in character, leptodermous modifications of *S. curta* with scattered leaves can, in many cases, be easily distinguished from leptodermous modifications of the *Immarginatae,* with which they might otherwise be easily confused.

5. Scapania lingulata Buch, Medd. Soc. F. et Fl. Fenn. **42**: 92. *f. 1–3.* 1916; Comm. Biol. Soc. Sci. Fenn. **3**^{1}: 69. *f. 15.* 1928. *Martinellia lingulata* Arnell, Göteborgs Kungl. Vetenskaps- och Vitterhets-Samhälles Handl. 31. 1922.

On rocks or exposed soil, rarely on rotten logs, caespitose or accompanied by other bryophytes.

Maine: Thunder Hole, Mt. Desert, 1920 (*Miss Lorenz*), listed by Miss Lorenz as *S. curta* in Rhodora **26**: 6. 1924: Miss Lorenz listed *S. curta* also from a second Mt. Desert station, but her specimens (according to Buch) are depauperate and hardly referable to any definite species.

Buch cites *S. lingulata* from Amaralik, Greenland, where it was

found in 1830 by Vahl, but no other North American stations are known at the present time. The species is widely distributed in Finland, Sweden, and Norway and has been found once in Iceland. Although it is still unknown from Siberia, Buch thinks that it is probably circumpolar in its range.

The relationship between *S. mucronata* and *S. lingulata* is very close, and it is not surprising that the earlier writers failed to separate them. As distinguishing characters of the latter species Buch points out the following: the slightly larger size; the lingulate, rather than obovate, ventral lobes; the somewhat larger leaf-cells, which measure 20–26 μ along the margin, instead of only 14–20 μ as in *S. mucronata;* and the usual presence of scattered unicellular teeth, which are in the form of equilateral triangles.

In Buch's revised description of *S. lingulata* (**4**, p. 69) he states that the ventral leaf-lobes may be either rounded at the apex with an apiculum consisting usually of a single cell, or else more gradually sharp-pointed, and adds that the latter condition is more frequent in poorly developed plants. This account implies that the lobes are always pointed. The writer, from an examination of specimens from Finland and Sweden, as well as from Mt. Desert, finds that the ventral lobes, in the majority of cases, conform to Buch's description. In a few cases, however, the lobes are rounded but without apicula, and similar lobes are represented in one of Buch's figures (**4,** *f. 15*^{3}).

Although the lobes of an occasional leaf may be entire throughout, marginal teeth are present in most cases and vary in number from one to seven on the ventral lobes and from one to five on the dorsal lobes. When a single tooth is present it usually marks the apex. The perianths of *S. lingulata* are lobed and ciliate at the mouth, and the green or reddish two-celled gemmae are oval, elliptical, or triangular. The perianths and gemmae, therefore, are much like those of *S. mucronata.*

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POLLINATION OF THE ERICACEAE: IV. LEDUM AND PYROLA

Harvey B. Lovell and John H. Lovell

Ledum groenlandicum Oeder

Ledum groenlandicum Oeder, Labrador tea, is occasionally abundant over small areas in damp acid soils in southern Maine. It is an upright evergreen shrub, from 3 to 10 dm. tall, with thick, oblong leaves, strongly revolute at the margins, which are densely rusty-woolly beneath, a provision, according to Kerner, against too rapid transpiration.

The small white flowers, which are slightly aromatic, are in terminal umbel-like clusters of ten to twenty-five flowers each, with two or three clusters at the end of each branch. The flowers are from 1.2 to 1.5 cm. broad. The stamens are usually five alternating with the petals, but frequently there are six, and in one instance there were eight. As *L. palustre* has normally ten stamens, the occurrence of extra stamens opposite the petals in *L. groenlandicum* may be a case of reversion.

The filaments are white, hairy at base, with yellowish anthers which open by terminal pores. The pollen is yellow and in tetrads. In mature buds 5 mm. long (Fig. 1, A) the stamens are 7 to 8 mm. long, their filaments bowed under tension, and spring or move upward when the petals are separated. The anther-pores open in the bud and pollen grains may be observed around these openings and on the stigma with which the anthers are in contact at this stage. It is probable that self-pollination occurs frequently in the bud. The flowers are nearly homogamous though showing a slight tendency to become protandrous.

The green capitate stigma, which bears five very small tubercles, remains persistent after the pollen has been shed. The ovary is likewise green and covered densely with short glandular hairs. Nectar is secreted sparingly by a green disc at the base of the ovary, where it is partially protected by the hairs on the filaments and ovary. It

slowly escapes between the filaments to the base of the petals. In fully expanded flowers (Fig. 1, B) the widely diverging stamens are 7 to 8 mm. long, while the erect style is one to two millimeters shorter. Self-pollination might still occur in lateral flowers, the pedicels of which were not erect.

The nectar is readily accessible to a wide variety of insects. Bumble-bees alight directly on the center of the flowers, where their legs and

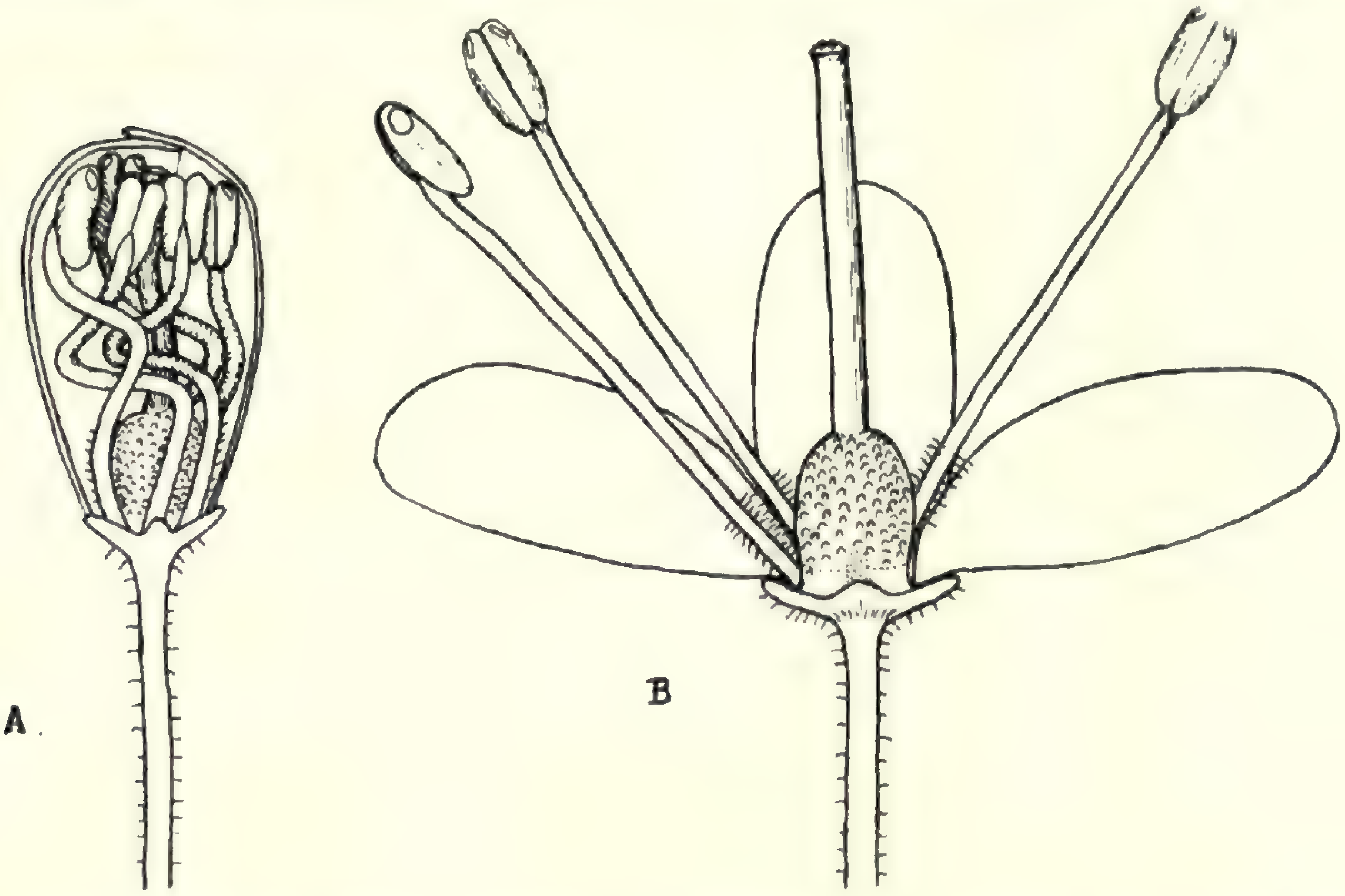

Fig. 1. Ledum groenlandicum: A, section of a mature bud, × 8; B, flower with 2 petals and 2 stamens removed, × 8.

the ventral side of the abdomen come in contact with the anthers, and effect pollination when they visit another flower. A few butterflies, the day-flying moth Thysbe, flies and beetles are occasional or rare visitors, but are of little importance as pollinators. We have been unable to verify Warming's statement that the flowers are occasionally anemophilous.[1]

The following insects were collected on the flowers from June 14th to July 1st at Waldoboro.

APOIDEA: Bombus ternarius Say ♀; B. terricola Kirby ♀ ☿; Andrena hippotes Rob. ♀; A. vicina Sm. ♀; A. sp. ♀; Osmia atriventris Cr. ♀.

LEPIDOPTERA: Pyrameis atalanta L; Hemaris thysbe Fab.

DIPTERA: Chilosia leucoparea Loew; Lucilia cornicina Fab.

COLEOPTERA: Agriotes stabilis Lec.

[1] Knuth, Blütenbiologie, Band II, Teil II, S. 47.

Pyrola elliptica Nutt.

Numerous observations have been made in Europe on the pollination of *Pyrola* and closely allied genera by Warming, Müller, Knuth,[1] and others; but there are no records for the American species, *P. elliptica* Nutt. and *P. americana* Sweet, which at Waldoboro, in southern Maine, are common in open sandy woodlands.

Shinleaf (*Pyrola elliptica*) is a perennial herb with basal elliptical leaves, from which rise an upright scape 1½ to 2 dm. tall, bearing from 5 to 14 nodding white flowers. The corolla has a breadth of 12 to 14 mm., and the petals are nearly or wholly separate. It is slightly irregular, the two upper petals standing close together during anthesis to protect the anthers, while the three lower are widely extended.

There are ten stamens, which are glabrous and awnless with the filaments attached to the anthers about 1 mm. below the pores. The anther is about 3 mm. long, two-beaked, with short tubes opening at the apex by an oval pore on each lobe. The pore-tubes are at first bright yellow becoming with age a reddish brown.

The ecology of the flower is divided into three distinct stages: in the first autogamy is prevented by the position of the anthers, in the second it becomes adapted to crossing, and in the third to automatic self-pollination. In mature buds the anthers stand close together around the stigma in an inverted position, resting on the outside of the filaments with the tubes pointing upward toward the ovary, as the flowers are nodding (Fig. 2^7). The pores open in the bud, this upside down position preventing the escape of the pollen and self-pollination.

As the flower expands it becomes adapted to cross-pollination. As the result of the unequal growth of the upper end of the filament, the anther slowly capsizes, or is turned right side up, that is, it rotates over the end of the filament (Fig. $2^{1, 2, 3}$) and downward on its inner side so that the pores point away from the ovary, the anthers coming into a nearly horizontal position beneath the two upper petals.

The flower having expanded, the style lengthens downward until it lies nearly in the concave lower petal. The stigma is nearly flat, its five lobes only slightly developed, but the tip is moist and in a receptive condition (Fig. 2^4). If it is visited by insects at this stage crossing may readily be effected. But long-continued collecting has yielded only six small Halictine bees, visiting the anthers only for pollen, which were not seen to touch the stigma, and one specimen of

[1] Knuth, Blütenbiologie. II, Teil 2, S s. 52.

Augochlora confusa. According to Knuth,[1] no insect visitors have ever been collected on the closely allied European *P. rotundifolia* L. Apparently cross-pollination is of rare occurrence. The flowers have a sweetish odor but are devoid of nectar.

During the final stage of anthesis autogamy may be brought about by a change in the position of the stigma. The five lobes now grow until they extend a millimeter beyond the ring at their base, and be-

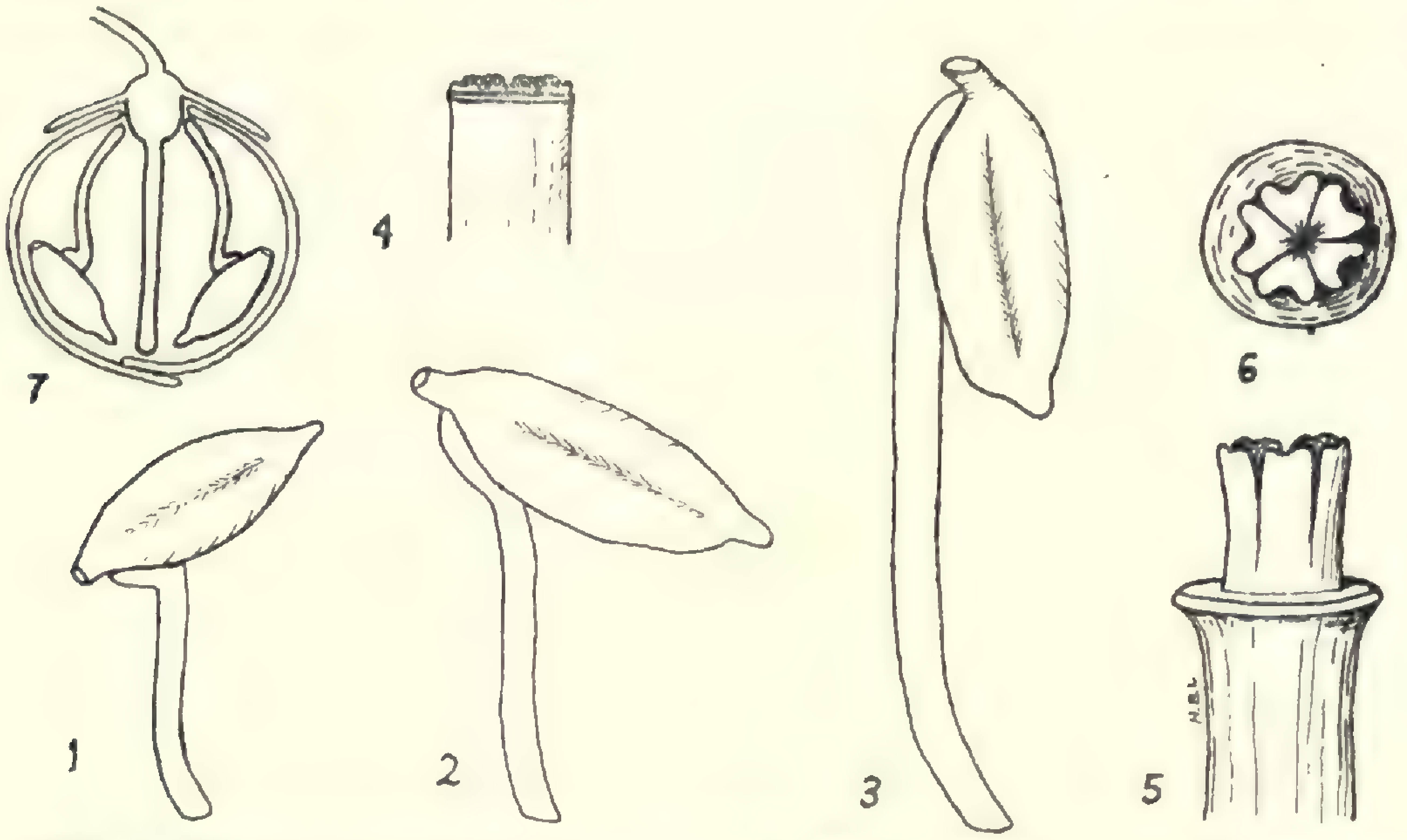

FIG. 2. PYROLA ELLIPTICA: 2^1, position of anther in bud, × 10; 2^2, position of anther in flower soon after opening, × 10; 2^3, position of anther in mature flower, × 10; 2^4, stigma in flower soon after opening, × 10; 2^5, stigma in mature flower, × 12; 2^6, end view of stigma of mature flower, × 12; 2^7, section of bud enlarged, showing position of anther.

come bifid at their tips and very viscid (FIG. $2^{5, 6}$). The lengthening of the style and a slight curvature forward brings the stigma beneath the pores of the anthers. Then if the flower is shaken by the wind or by insects, the pollen falls freely on this large glutinous surface and self-pollination results.

As the result of long and careful observation the following visitors were captured on the flowers, collecting pollen, from July 17th to 19th.

APOIDEA: HALICTUS VIRIDATUS Lovell ♀, c. p.; H. PLANATUS Lov. ♀, c. p.; H. PILOSUS Sm. ♀, c. p.; AUGOCHLORA CONFUSA Rob. ♀, c. p.

Bombus ternarius Say, ♀, was twice seen to fly within an inch of a flower-cluster, but failed to alight.

[1] Knuth, Blütenbiologie, II, Teil 2, S. 53.

Pyrola americana Sweet

This species is closely allied to *P. elliptica*, but may be readily distinguished by its thick round leaves and longer sepals. Its flower ecology is essentially the same, but the stigmatic lobes are less elongated and do not show the bifid divisions found in the shinleaf. Although the flowers were under observation on several occasions for a long time both at Waldoboro and at the Knox Arboretum, Thomaston, where it is very common, no insect visitors were recorded.

Waldoboro, Maine.

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XIII

Norman C. Fassett

Astragalus canadensis L., var. **longilobus**, n. var., calycis dentibus 2.5–5.5 mm. longis, tubo 4–5 mm. longo; calycibus et foliolis infra strigosis var. typicum simulantibus.—Minnesota: Willmar, July, 1892, *W. D. Frost* (Wis.[1]); Jefferson, July 20, 1889, *H. L. Lyons*, no. 257 (Minn.). Iowa: Decorah, July 13, 1881, *L. H. Pammel* (Ia.); common in thickets, along roadsides, etc., Chickasaw Co., July 11, 1926, *W. D. Spiker* (Ia.); Decatur Co., July 24, 1903, *J. P. Anderson* (Ia.). Wisconsin: railroad cut, New Richmond, August 5, 1934, *N. C. Fassett*, no. 17104 (Wis.); Pine Bluff, August 6, 1889, *L. S. Cheney* (Wis.); Madison [about 1861], *T. J. Hale* (Wis.); Little Sturgeon, July, 1884, *J. H. Schuette* (Wis.; Field); sandy roadside, Binghampton, July 8, 1930, *W. E. Rogers*, no. 278 (type in Herb. University of Wisconsin); roadside, low ground, Winchester, August 12, 1929, *N. C. Fassett & W. T. McLaughlin*, no. 9336 (Wis.). Indiana: bank of Wabash River 1½ mi. south of East Mt. Carmel, rare here, June 18, 1918, *C. C. Deam*, no. 25469 (Deam); on wooded hillside east of Newburg, July 2, 1915, *Deam*, no. 16785 (Deam); wooded hills east of Winona Lake, Kosciusko Co., July 29, 1897, *Deam* (Deam; Field); 5 mi. northeast of Elkhart, July 2, 1921, *Deam*, no. 34424 (Deam).

The widespread typical *A. canadensis* has the calyx-lobes not more than one half the length of the tube (lobes 1–3 mm. long; tube 4.5–6 mm. long). *A. canadensis* var. *carolinianus* (L.) Jones,[2] of the southern Alleghenies, has the lobes usually more than half the length of the tube (lobes 2–3.7 mm. long; tube 4–5 mm. long). *A. canadensis* var.

[1] Specimens located as follows: Wis., University of Wisconsin; Minn., University of Minnesota; Ia., Iowa State College; Field, Field Museum of Chicago; Deam, Herbarium of C. C. Deam.

[2] Proc. Calif. Acad. ser. 2: v. 647 (1895).

longilobus is closely related to var. *carolinianus,* and often has the calyx-lobes better developed even than in that variety. In some individuals the lobes are longer than the tube, and on the specimen from Winchester, Wisconsin, an occasional lobe reaches 5.5 mm. in length and 2 mm. in width, and is distinctly foliaceous. The pubescence of var. *longilobus,* however, is identical with that of typical *A. canadensis.*

Oxytropis **chartacea**, n. sp., acaulis cespitosa; stipulis albis membranaceis, partibus connatis 7–15 mm. longis adpresse sericeo-villosis, partibus liberis 3–9 mm. longis glabris ciliatis; foliis 0.5–2.5 dm. longis, foliolis 9–17-jugis ovatis sericeo-pilosis, basi rotundis, saepe 2.3 cm. longis 7 mm. latis, margine subrevolutis; scapis 1.5–4 dm. longis sericeo-pilosis vel -villosis; spicis 3–12 cm. longis; bracteis calycem subaequantibus, subtus dense villosis, supra glabris vel glabratis; calycibus albo-tomentosis tubo 4–7 mm. longo, dentibus 1.5–3 mm. longis; corollis violaceis, deinde cyaneis; leguminibus suberectis chartaceis 1 cm. longis bilocularibus albo-pilosis saepe leviter nigro-pilosis; seminibus reniformis 1–1.2 mm. latis.—Wisconsin: sandy beach of Pigeon Lake, Drummond, July 19, 1928, *Ludlow Griscom;* same locality, July 28, 1934, *N. C. Fassett,* no. 16478; sandy shore of "Lake Huron," Plainfield, September 15, 1934, *Fassett,* no. 16704 (type in the Herbarium of the University of Wisconsin); sandy shore of Plainfield Lake, Plainfield, June 30, 1935, *S. C. Wadmond & N. C. Fassett,* no. 17386.

This species closely resembles *O. gaspensis* Fernald & Kelsey and *O. johannensis* Fernald. From the former it differs in its purple or blue flowers and villous bracts, and from the latter in its villous stipules and much smaller pods. From *O. Lamberti* and its relatives it differs in its papery pods, its densely tomentose calyx, its scapes with spreading pubescence, and the rounded bases of its leaflets.

Amphicarpa bracteata (L.) Fernald, var. **Pitcheri**, n. comb. *Glycine comosa* L. Sp. Pl. ii. 754 (1753), not *Falcata comosa* Am. Auct. *A. Pitcheri* T. & G., Fl. N. Am. i. 292 (1838).

In view of the doubt expressed by various writers, and indicated by numerous herbarium sheets with questioned determinations, of the distinctness of our two so-called species of *Amphicarpa,* it is surprising that varietal status for *A. Pitcheri* has not previously been proposed. Perusal of literature, and study in the herbarium and in the field, brings to light the following differences:

A. bracteata: stem with closely reflexed white or yellowish hairs; median stipules 3 mm. long; terminal leaflet 1.3–6 cm. long; inflorescence simple, 1–8-flowered; floral bracts 2–2.5 mm. long, the lower exceeded by the pedicels; calyx-tube 4–5 mm. long, the teeth short and broad; blade

of keel-petals longer than the claw; pod glabrous on the face, the pubescence of the lower suture antrorse toward the base; seeds 3.5 mm. long.

A. bracteata var. Pitcheri: stems with mostly spreading, reddish, villous hairs; median stipules 4–5 mm. long; terminal leaflet 5–10 cm. long; inflorescence branched, 7–17-flowered; floral bracts 2.5–3.5 mm. long, the lower exceeding the pedicels; calyx-tube 4.5–6 mm. long, the teeth lanceolate; blade of keel-petals about equalling the claw; fruit strigose on the face, the pubescence of the lower suture retrorse toward the base; seeds 3.8–5.5 mm. long.

However, it is difficult to find a specimen which can be identified as one species or the other by all of these characters, and there is not sufficient correlation among any of them to warrant specific differentiation. Indeed, not one of these characters is of a clean-cut qualitative nature; var. *Pitcheri* is simply a vigorous, coarser, more villous form of *A. bracteata*. The ranges of the two are almost identical, *A. bracteata* extending farther northeastward, and var. *Pitcheri* going farther south, rarely into Mexico.

Petalostemum purpureum (Vent.) Rydb., f. **pubescens** n. comb. *P. violaceum* var. *pubescens* Gray, Pl. Wright. i. 46 (1852), in part. *P. pubescens* Heller, Muhlenbergia i. 28 (August, 1901), in part, not *P. pubescens* A. Nels.

P. virgatum Scheele, Linnaea xxi. 461 (1848) is identified with this by Gray. *P. violaceum* var. *pubescens* as described by Gray was a mixture, the Wright and Lindheimer plants belonging to *P. pulcherrima* Heller (*P. virgatum* Scheele, not Nees & Schw.), but the Fendler plant, cited as type, is a pubescent phase of *P. purpureum*. This form, with tomentose stem and villous, gland-dotted leaves, is sporadic throughout the range of the species; there are specimens in the Gray Herbarium from Minnesota, Iowa, South Dakota, Nebraska, Oklahoma, Texas, Saskatchewan, Alberta, Montana, Wyoming, Colorado and New Mexico. *P. purpureum* var. *molle* (Rydb.) A. Nels. is a more well-marked local phase of the species, with the leaves practically without glands, and like the stem densely pilose.

Desmodium grandiflorum (Walt.) DC. As has been demonstrated by Blake[1] and by Schindler[2] *Hedysarum grandiflorum* Walt. was not the *D. grandiflorum* of recent manuals, but *D. bracteosum* (Michx.) DC. The latter name, however, should not be displaced by *D. grandiflorum*, for, as Blake pointed out, there was an earlier *H. grandiflorum* Pall.[3] The adoption, in 1930, of the "homonym rule" makes invalid the name *D. grandiflorum* as applied to any American plant.

[1] Bot. Gaz. lxxviii. 277 (1924).
[2] Fedde, Rep. xxii. 276 (1926).
[3] Reise ii. 743 (1773).

The *D. grandiflorum* of ed. 7 of Gray's Manual, then, becomes D. ACUMINATUM (Michx.) DC.,[1] while the *D. bracteosum* of Gray's Manual remains D. BRACTEOSUM (Michx.) DC.[2] The description of *H. bracteosum* Michx. includes the phrase "stipulis subulatis" which hardly applies to *D. bracteosum* as at present understood, but a copy of the Flora Boreali-Americana annotated by M. L. Fernald in the Michaux Herbarium bears the note "*bracteosum* OK," and Schindler appears also to have examined the type of *H. bracteosum*.

GLEDITSIA TRIACANTHOS L., forma **inermis**, n. comb. *G. triacanthos*, β. *inermis* Pursh, Fl. Am. Sept. i. 221 (1814).

Trees lacking the spines of ordinary *G. triacanthos* are of sporadic occurrence with the commoner type, and do not constitute a true variety.

The writer wishes to acknowledge the courtesy of the staff of the Gray Herbarium in making available to him the facilities of that institution.

MADISON, WISCONSIN.

NEW RUST SPECIES AND HOSTS FROM RHODE ISLAND

WILLIS R. HUNT

FORTY-TWO rust species, and fourteen hosts for thirty previously listed rusts, were reported for the first time as new to Rhode Island by the writer in *The Uredinales or Rusts of Connecticut and the other New England States* (Conn. State Geol. and Nat. Hist. Surv. Bul. 36: 1–198. 1926). The collections were made for the most part by Farlow of Harvard, Collins of Brown, and the author while studying rusts at Yale under Dr. G. P. Clinton. Numerous collections have been made since then by the writer, and five new rust species, two rust varieties, and five new hosts from this state are here reported for the first time. The specimens are in the writer's herbarium at Osborn Botanical Laboratory, Yale University.

In the treatment of rusts in this paper the sequence to show relationship other than that indicated by hosts, and nomenclature used by Arthur in the *Manual of the Rusts in the United States and Canada*, 1934, will be followed. The authorities for the hosts are those of

[1] For synonomy see Schindler, l. c., 258. He takes up *D. glutinosum* Muhl. for this species, but in view of the questionable priority of *D. glutinosum* over *H. acuminatum* it seems inadvisable to displace a name long familiar in American botanical literature.

[2] For synonomy see Schindler, l. c., 276.

Gray's Manual, 7th edition. Complete data will be given for each collection. An asterisk preceding the name of the rust indicates that it is new to the state; a double asterisk denotes that it is a new variety, and if only the host is new an asterisk will precede it.

* Uredinopsis mirabilis (Peck) Magn. On *Onoclea sensibilis* L.: II, Hopkinton, July 30, '35.

* Pucciniastrum myrtilli (Schum.) Arth. On *Gaylussacia baccata* (Wang.) K. Koch.: II, Exeter, Sept. 1, '31.

* Coleosporium vernoniae B. & C. On *Vernonia noveboracensis* (L.) Willd.: II, Hopkinton, July 30, '35.

** Puccinia andropogonis **pentstemonis** (Schw.) n. comb. *Aecidium Pentstemonis* Schw. Schr. Nat. Ges. Leipzig 1: 68. 1822. (Arthur, *Manual Rusts U. S. and Canada.* 120. (1934). Variety of *Puccinia andropogonis* Schw. On *Chelone glabra* L.: O–I, Westerly, July 16, '35.

Puccinia peridermiospora (Ellis & Tr.) Arth. On **Fraxinus americana* L.: O–I, Charlestown, Aug. 6, '35.

Puccinia seymouriana Arth. On **Cephalanthus occidentalis* L.: O, Westerly, July 16, '35.

** Puccinia rubigo-vera **agropyrina** (Erikss.) n. comb. *Puccinia agropyrina* Erikss. Ann. Sci. Nat. VIII. 9: 273. 1899. (Arthur, *Manual Rusts U. S. and Canada.* 180. 1934). Variety of *Puccinia rubigo-vera* (DC.) Wint. On *Thalictrum polygamum* Muhl.: O, Westerly, July 16, '35.

Puccinia xanthii Schw. On **Xanthium canadense* Mill.: III, Westerly, Sept. 14, '35.

Puccinia extensicola **solidaginis** (Schw.) n. comb. *Aecidium Solidaginis* Schw. Schr. Nat. Ges. Leipzig 1: 68. 1822. (Arthur, *Manual Rusts U. S. and Canada.* 198. 1934). Variety of *Puccinia extensicola* Plowr. On **Solidago sempervirens* L.: O–I, Block Island, July 17, '35.

* Puccinia limosae Magn. On *Lysimachia quadrifolia* L.: O–I, Westerly, July 16, '35; O–I, Hopkinton, July 30, '35.

Uromyces holwayi Lagerh. On **Lilium superbum* L.: III, Westerly, July 16, '35.

* Gymnosporangium ellisii (Berk.) Farl. On *Myrica carolinensis* Mill.: O–I, Charlestown, July 10, '32; O–I, Westerly, July 16, '35: III, Charlestown, July 10, '32. The telial stage was observed on *Chamaecyparis thyoides* (L.) B. S. P. but not collected.

Jenks Biological Laboratory,
Lafayette College,
Easton, Pennsylvania.

CORNUS DRUMMONDII

H. W. Rickett

Among the plants collected by Drummond in Louisiana in 1832 and now preserved in the herbarium of the Royal Botanic Garden at Kew is the specimen (No. 138) upon which C. A. Meyer founded *Cornus Drummondii*.[1] In Hooker's account of Drummond's collections it is listed as No. 366, *C. alba*.[2] The plant is evidently related to *C. asperifolia* Michx. The leaves, like those of the latter species, are rather broadly ovate with acuminate tips, and harsh above with minute appressed two-parted hairs. The pubescence of their lower surfaces, however, is composed of abundant straight appressed hairs, instead of the loosely spreading woolly hairs of *C. asperifolia*. These characters are noticed by Meyer in his description: "*foliis . . . late ellipticis ovatisve acuminatis basi rotundatis, subtus tuberculatis setisque (elongatis) bipartitis adpressis scabris dense incanis . . .*" He was apparently unfamiliar with *C. asperifolia;* the one plant which he saw that might be referred to that species he placed with *C. excelsa*.

C. asperifolia is rather variable in the shape of its leaves and in the degree of roughness of their upper surfaces; also in the size and shape of the stones of the white drupes. In their study of *Cornus*, Coulter and Evans distinguished by its rougher leaves and shorter stones a variety, which they found to be characteristic of the western parts of the range of the species. To this variety they applied Meyer's specific epithet *Drummondii*.[3] *C. Drummondii*, however, as is apparent from the specimen and from Meyer's description, is quite distinct from both typical *C. asperifolia* Michx. and var. *Drummondii* Coult. & Evans.

The species or variety represented by Drummond's plant has escaped further notice. Meyer cited a specimen from Texas (*Wiedmann*). Two specimens in the herbarium of the Missouri Botanical Garden seem to be the same; one collected by *Fendler* at New Orleans in 1846, the other by *C. R. Ball* near Alexandria, Louisiana, in 1899. Collections have been recently made by *Drouet* near Columbia, Missouri, which present similar characters. Some of these specimens, however, exhibit a scantier pubescence and a somewhat smaller leaf than *C. Drummondii*, and in these respects resemble the more pubescent forms of another variable species, *C. racemosa* Lam. (*C.*

[1] Mem. Acad. Imp. Sci. St. Petersb. **7:** 210 (1846).
[2] Comp. Bot. Mag. **1:** 48 (1835).
[3] Bot. Gaz. **15:** 36 (1890).

paniculata L'Her., *C. candidissima* of various authors, probably not Miller). The cymes and fruits of this species are quite similar to those of *C. asperifolia,* the cymes perhaps usually less ample, the stones of the drupes more globular, less inclined to be oblique and flattened. The pedicels are in general longer (2–5 mm.) than those of *C. asperifolia* (1–3 mm.). The leaves are smaller, more elliptical, and vary from glabrous to more or less pubescent on either or both surfaces with appressed two-parted hairs.

The existence of forms intermediate between the well known species of *Cornus* has long been ascribed to hybridization. The sporadic occurrence of *C. Drummondii* suggests that it may be a hybrid of the two species between which it is intermediate. Against this it must be advanced that *C. racemosa* is apparently infrequent in the regions where *C. Drummondii* has been collected. It is interesting, however, to note that the plants from this vicinity which have been referred to *C. Drummondii* were collected not far from plants of *C. racemosa,* which is rare here. It is well known that *C. racemosa* is connected by a series of intermediate forms with the more southern *C. stricta* Lam.

Several investigators have lately called attention both to the importance of hybrids in an understanding of plant populations and to the dangers of a too easy decision that intermediate forms are indeed hybrids. It is perhaps worthy of more general recognition that hybridity, in relation to taxonomy, may mean two different things. An initial cross may lead to the formation of fertile races, which may be constant, as in such genera as *Hieracium* and *Galeopsis,* or which may exhibit Mendelian segregation and give rise to a host of fertile but inconstant forms, as in certain species of *Viola.* Or the hybrid may be sterile or nearly so, and its occurrence limited to the first generation and to the proximity of the parents. It is in the latter sense that *C. Drummondii* may possibly be a hybrid. In any case, further collection should provide valuable information on its status.

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University of Missouri.

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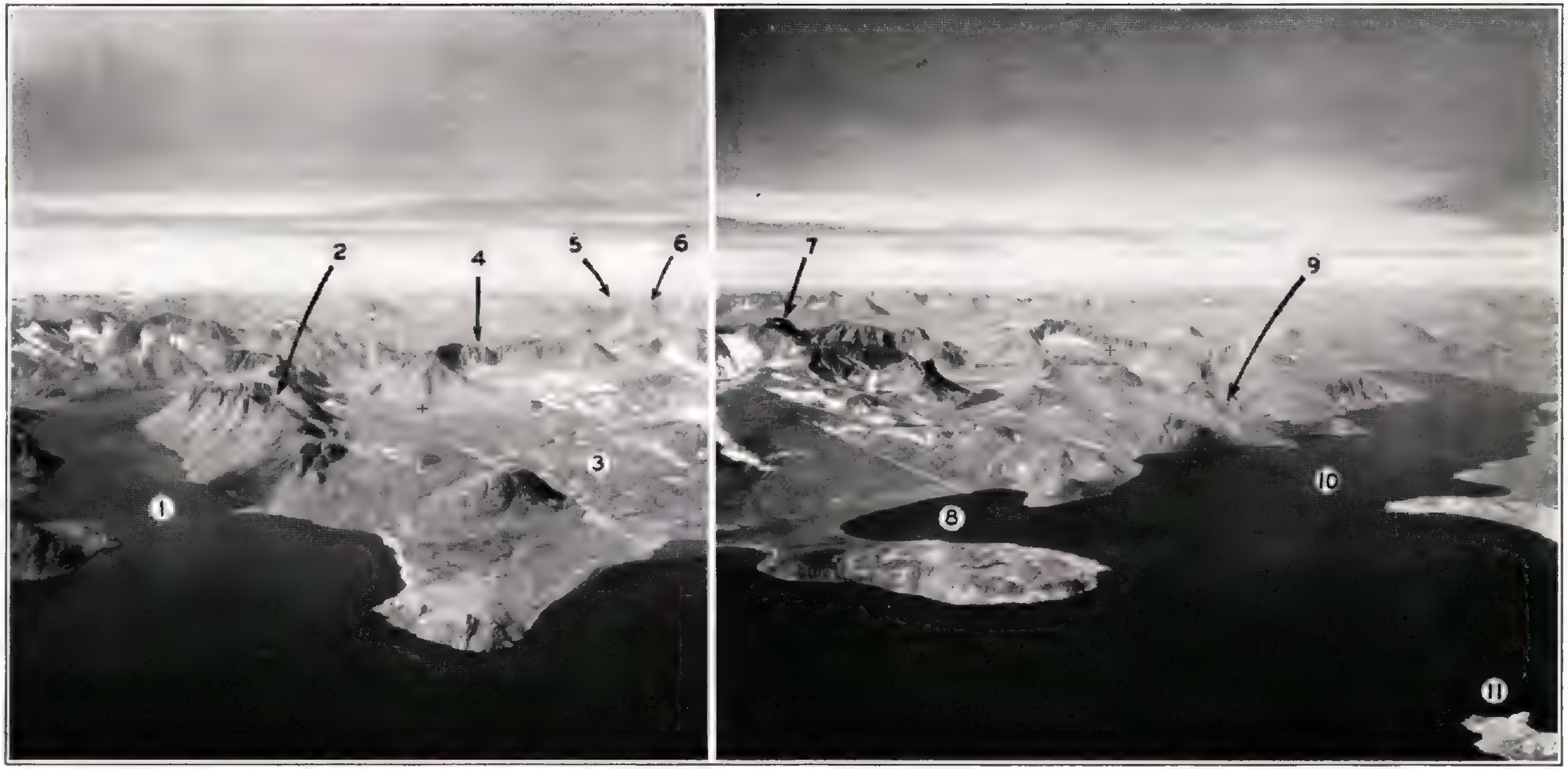
No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.



Aerial View of Kangalaksiorvik-Komaktorvik Region from the East, 1931 (*courtesy of* Professor Alexander Forbes and The American Geographical Society). Fig. 1, Komaktorvik; fig. 2, K-2 Mountain; fig. 3, K River; fig. 4, Valley of Komaktorvik River (back of first range of mountains); fig. 5, X Peak; fig. 6, Precipice Mountain; fig. 7, Mount Tetragona; fig. 8, Seaplane Cove; fig. 9, Valley of the Bryant Lakes; fig. 10, Kangalaksiorvik; fig. 11, Amiktok.

Rhodora

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THE RESIGNATION OF JAMES FRANKLIN COLLINS

SUBSCRIBERS to RHODORA will regret to note the absence of the name of JAMES FRANKLIN COLLINS from the enumeration of Editors on the cover. Professor Collins, a contributor to the pages of RHODORA from the initial volume (1899) and always relied upon to do his full share in support of the journal and in faithfully carrying on the gratuitous duties of the Cryptogamic Curator of the Herbarium of the New England Botanical Club, has asked to be relieved of these responsibilities. The Council of the Club has regretfully acceded to his wish; and the Editors take this occasion to express their keen appreciation of the always cheerful helpfulness and unbounded generosity of their former associate. The half-tone plates of *Oxytropis* in vol. xxx and the remarkable and much praised plates of *Draba* in vol. xxxvi, made from photographs most generously contributed by Professor Collins, sufficiently indicate the great debt RHODORA owes this single editor. We anticipate no cessation for many years of his ever ready helpfulness to the journal and we voice the hopes of the Editors and all friends of RHODORA in wishing Professor Collins, necessarily limited by physical handicaps of advancing years, a long period of happy studies in his loved science, as he looks back with satisfaction upon his more than three score and ten years of kindly and productive activity.

Dr. STUART KIMBALL HARRIS, the newly appointed Associate Editor, brings to RHODORA a keen enthusiasm for botany and botanizing in all their phases and the older Editors heartily welcome his coöperation.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXI

BOTANICAL RESULTS OF THE GRENFELL-FORBES NORTHERN LABRADOR EXPEDITION, 1931

Ernst C. Abbe

(Plates 408–411)[1]

Introduction

During the summer of 1931, Dr. Alexander Forbes of Harvard University led an expedition to the northeastern part of Labrador, primarily to obtain data for an adequate topographic map of the region. In addition to organizing the expedition, Dr. Forbes also acted as navigator of the *Ramah*, the Nova Scotia-built schooner which was the means of transportation of the expedition. In this difficult task he was ably assisted by Mr. F. T. Hogg, architect, as mate. The direction of the actual surveying (primarily by means of aerial photography) was in the hands of Mr. O. M. Miller of the American Geographical Society, who had just devised a method especially adapted to mountainous country of making maps from aerial photographs, which he calls "plane-tabling from the air." The balance of the scientific staff consisted of Mr. Noel Odell, geologist and mountaineer, who was interested in the structural and glacial geology of the region, and myself who represented the Gray Herbarium as the botanist of the expedition.[2] From the botanical point of view it was considered especially important to investigate the flora at the higher elevations in the Torngat and Kaumajet Mountains because of the current theory that these were not ice-covered during the Wisconsin. It had already been established by Professor Fernald that there is a direct correlation between the presence of "cordilleran" relics and absence of glaciation during the Wisconsin in the more southern nunatak and driftless areas, especially in the Gulf of St. Lawrence region. From earlier collections in northeastern Labrador

[1] The cost of reproduction of the aerial photographs has been met by Professor Alexander Forbes of the Harvard Medical School, organizer and leader of the Expedition. It is a pleasure to acknowledge his generosity not only in this respect, but in numberless other ways both during and after the return of the expedition.

[2] At this point should be mentioned the various members of the expedition who provided valuable aid in collecting plants in the field. These were Mrs. M. Odell, Mrs. M. C. D. Hogg, Miss K. Forbes, Noel Odell, Edwin D. Brooks, Jr., Hoyt Pease, and Brewster Morris, to all of whom I express my thanks.

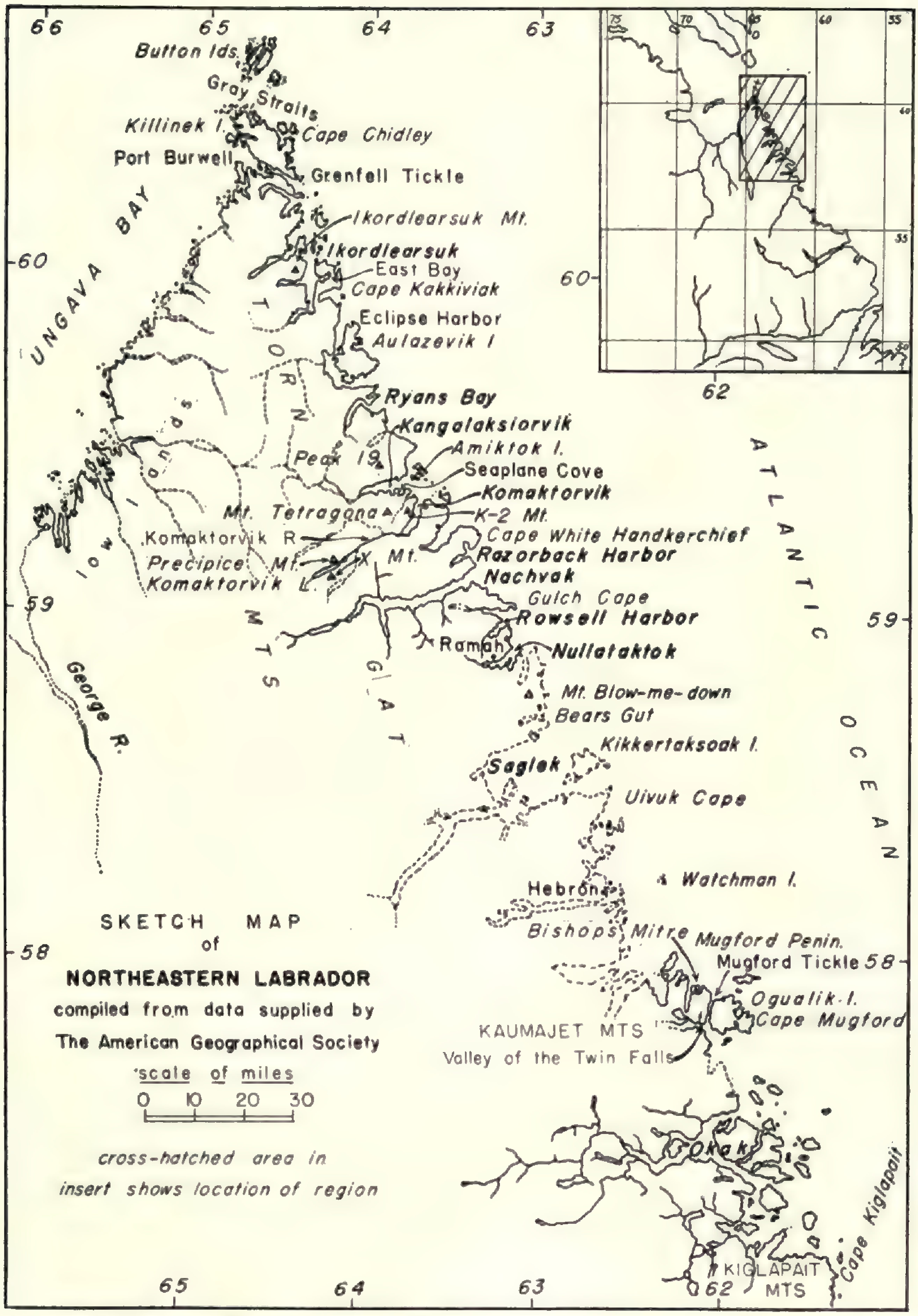


FIG. 1. MAP OF NORTHEASTERN LABRADOR COMPILED FROM DATA SUPPLIED BY THE AMERICAN GEOGRAPHICAL SOCIETY.

Coast from Button Islands to Nachvak based on a more complete Map by O. M. MILLER at THE AMERICAN GEOGRAPHICAL SOCIETY from data obtained on the Expedition; Nachvak based on preliminary survey of R. A. DALY with corrections by A. P. COLEMAN; south of Nachvak to Okak from sketches of W. T. GRENFELL and others; Okak Region from surveys of E. P. WHEELER, 2d.

it was known that occasional "cordilleran" types occur at localities near sea-level, and it was to be expected that even more might have persisted on or near the mountain tops. On the mountains investigated, this did not prove to be the case. Without going into the matter in further detail at this point it appears that if nunataks existed in northeastern Labrador and were capable of supporting plant life during the height of the last glaciation, they were similar in their sparse flora to the contemporary coastal nunataks of more northern Greenland rather than to the unglaciated Gulf of St. Lawrence areas. The presence of "cordilleran" species in northeastern Labrador thus calls for some other explanation, either by their postglacial migration or by their persistence in place at low altitudes in the sheltered fiords, *below* the level of the ice. The latter solution appears to be the more reasonable by analogy with Greenland today. This requires further explanation which is reserved until after the current geological theories have been reviewed.

Geology of Northeastern Labrador

Important as a background for the consideration of the flora of northeastern Labrador, especially that of the higher elevations, is the geology and physiography of the region. For the purposes of this article, northeastern Labrador may be considered as that part of the Labrador peninsula north of latitude 57° 30′ and east of Ungava Bay (see map, fig. 1). This includes two major mountain groups, the Kaumajet mountains of the Mugford region, and north of Saglek the various ranges of the Torngat mountains. The western part of northeastern Labrador is an undulating lowland. Fundamentally the entire area appears to be a rolling peneplain which has been elevated on the Atlantic side and depressed on the Ungava Bay side. Remnants of the old land surface are everywhere apparent in the Torngat mountains and often form the restricted flat areas characteristic of the very tops of many of the peaks. This is strikingly apparent from the air, as I had opportunity to observe when I participated in the photographic flight of the afternoon of August third. In the mountains, frost action, erosion, and the activity of ice, both as major factors in shaping the fjords and larger valleys and as minor ones in producing the small hanging valleys, have all had a profound effect on the old land-surface.

That glacial activity was responsible for some of the land-forms in

northeastern Labrador has been recognized ever since the early observations of Lieber[1] in 1860. Since that time several geologists including Daly,[2] Coleman[3] and more recently Odell[4] have intensively investigated the geology of the region. But as yet there is increasing difference of opinion in the interpretation of the interplay of forces responsible for the broken topography of the mountains.

The observations of Lieber were limited by the circumstances attendant on an attempt to do geological work on an expedition whose primary purpose was quite different. Furthermore his conclusions were affected by the fact that in the 1860's the interpretation of glacial phenomena was still in the early phase of development when past glaciations were considered in the light of the known behavior of the mountain glaciers of Europe. However as time passed, geologists took the opportunity to study the great continental glaciers, such as those of Spitzbergen and Greenland with the result that major changes occurred in the interpretation of some of the basic phenomena of glaciation. It is, therefore, to the observations of the later geologists that we should turn our attention rather than to those of Lieber and his period. First among these later geologists we should consider Daly, whose masterly work in the Nachvak region in 1900 led him to the conclusion that a general glaciation had not reached above the 1600 to 2100 foot contour in the mountains on the north side of Nachvak. This conclusion was based on the absence of erratics or of *roches moutonnées* above that level and the presence of a more or less continuous *Felsenmeer* composed of deeply weathered and sharp-angled rocks above this level. Daly concludes that the glacial phenomena which he observed could be attributed to the passage of tongues of the major ice-mass of the Labrador glacier through the valleys of the Torngat.

The next major analysis of glacial phenomena was made by Coleman in the seasons of 1915–16, in the Nachvak and Kangalaksiorvik[5] regions. His observations confirmed those of Daly and he also con-

[1] Lieber, O. M. Notes on the Geology of the Coast of Labrador, U. S. Coast Survey Rept. 1860. App. no. 42, 1–7 (1860).

[2] Daly, R. A. The Geology of the Northeast Coast of Labrador. Bull. Mus. Comp. Zool., Harvard Univ., xxxviii. 205–270 (1902).

[3] Coleman, A. P. Northeastern Part of Labrador and New Quebec. Can. Dep. Mines, Geol. Surv. Mem. 124. 1–68 (1921).

[4] Odell, N. E. The Mountains of Northern Labrador. Geog. Jour., lxxxii. 193–210, 315–325 (1933).

[5] Because of a misidentification he refers to Kangalaksiorvik as "Komaktorvik" in his report.

cluded that glaciation in that region of Labrador did not extend above approximately the 2100 foot contour. But he attributed the glaciation to valley glaciers rather than to lobes of the major Labradorean ice-sheet.

Most recently, the researches of Odell, primarily in the coast and central ranges of the Torngat and in the Kaumajet, have led him to conclude that the Labradorean ice-sheet not only reached the Atlantic through the transverse valleys of the Torngats, but that it also completely inundated the Torngat and Kaumajet ranges. His evidence is the occurrence of ice-polishing at practically the summit of the highest peak of the Central Range of the Torngats and *moutonnée* surfaces on one of the highest summits of the Kaumajets. The presence of rounded summits with a covering of rock debris[1] he attributes in a large part to post-glacial weathering[2] which from his observations in the much more recently glaciated mountains of Spitzbergen is quite capable of producing such a condition. Especially would this seem to be the case since the mountain tops of the coastal ranges would have been free of the continental ice for a much longer period of time than were the lower elevations and consequently would have weathered much more than the lower ice-protected surfaces. Also during this period of ice-recession, weathering processes were doubtless even more severe in their action than they are today, and all the geologists who have observed conditions today attest to the violence of even contemporary weathering in northeastern Labrador.

It is beyond the province of this paper to go into further detail concerning the technicalities and interpretation of the glacial phenomena of the region, but it is evident that there are two distinct schools of thought among geologists in their interpretation of its glacial history.

The structural geology of the region has been described in some detail by various geologists, such as Low, Coleman, Daly, Bell, Lieber, and Odell. An excellent review of earlier work is given by Coleman (l. c.). In order to provide an idea of the geological formations at the major centers of botanical collecting on this expedition, the following

[1] Excellent photographs of this condition are given by Odell (l. c., opp. p. 318), by Coleman (l. c., Pl. VIA), and by Delabarre (Bull. Geogr. Soc. Phila., iii.) opp. p. 168 (1902).

[2] That a mantle of this type could even persist at higher levels through a glaciation has been brought out by Hobbs, W. H. The Glaciers of Mountain and Continent. Science, n. s. lxxix. 419–422 (1934).

summary is given, largely based on data very kindly supplied by Mr. Odell.[1]

(Kaumajet Mountains)

The greater part of the Kaumajets is of basic volcanic rock: diabase, basalt, ash, with some peridotite and serpentine (the latter in the Valley of the Twin Falls). The upper part of the Bishop's Mitre has trachytic tuff which is more acid than the magnesium- and calcium-rich silicates of the basement series, which are chiefly granite-gneisses. But between the latter and the volcanics occur in most places, as far as known, about forty to fifty feet of clay-slate of sedimentary origin. It would seem that Daly's Ramah series, extending from Saglek Bay to Nachvak and consisting of slates, quartzites and dolomites, may be the northward continuation of the Mugford slate, but this requires further proof. At most, the Mugford slate attains an elevation of five hundred feet above sea-level in the Mugford region. Its possible northward continuation outcrops at Ramah and Rowsell Harbor. Delabarre mentions a great deal of slate, sandstone, and conglomerate as occurring from about seven miles north of Saglek and reaching beyond Ramah for at least four or five miles. In accordance with these observations, Coleman's map of the "northeastern portion of Labrador and New Quebec" (l. c.) shows the Ramah series as extending directly to the eastern part of the south shore of Nachvak. Thus, a portion of the formation characterizing the Kaumajet region extends locally north into the Torngat region of predominantly Archean formations.

(Torngat Mountains)

Kangalaksiorvik, *Tetragona*, and *The Four Peaks*. The rocks here are garnet granulite, and garnet pyroxene-gneiss with much intrusive aplite and pegmatite, and diabase in dike form. There are also dikes of the rather uncommon hypersthene-gneiss near the "K" river and in the "K" range. The predominating formations of Mt. Tetragona itself are pyroxenite and amphibolite with the garnet pyroxene-gneiss.

Komaktorvik Lake Region. This is predominantly quartz-garnet granulite, with hypersthene-granulite at the summit of "X" peak.

Ikordlearsuk Region. On the east side of the fiord occur hornblende-gneiss and intrusive amphibolite; on the west side, garnet and hornblende and biotite-gneisses and schists. The highest summit of Ikordlearsuk Mt. is garnet biotite-gneiss.

[1] In lit.

The great contrast between the Kaumajet Mountains of the Mugford region and the Torngat Mountains is in the basic, volcanic or sedimentary rocks of the former, underlain by the acid, highly siliceous, metamorphic rocks characterizing the latter.

Botanical Work in Northeastern Labrador

a. Earlier Collections

In contrast to the rather late start made in the middle of the nineteenth century in systematic investigation of the geology of northeastern Labrador stands the pioneer botanical collecting started early in the eighteenth century by the Moravian missionaries. So much progress had been made by 1830 that Meyer[1] was able to publish his remarkably complete flora of the east coast of Labrador. In it he lists 169 different vascular plants from Labrador many of which were collected in the vicinity of the Moravian missions at Okak and Nain, by the resident missionaries. These collections were apparently made with the idea of eking out the slender funds of the "Unitas Fratrum" by their sale, especially in central Europe They were accordingly sent to the central offices of the Mission in Germany from which they were distributed. An excellent account of the early activities of these Moravian missionaries as plant-collectors is given by M. P. Porsild.[2] The botanical tradition established and carried on by such Moravian brethren as Hertzberg, Weiz, and Stecker is today ably maintained by the Rev. P. Hettasch who is an excellent collector and has contributed to the Royal Herbarium of Kew. It was a real privilege to have had the opportunity of seeing his rock-garden of native plants at Nain, and to have seen his herbarium representative of the local flora. In addition to the numerous collections made by the Moravian missionaries in the last hundred and fifty years, there have been collections made by occasional visitors to the east coast of Labrador, notable among whom are Sornborger,[3] Low,[4] Delabarre,[5] Woodworth,[6]

[1] Meyer, Ernst. De Plantis Labradoricis. Lipsiae (1830).

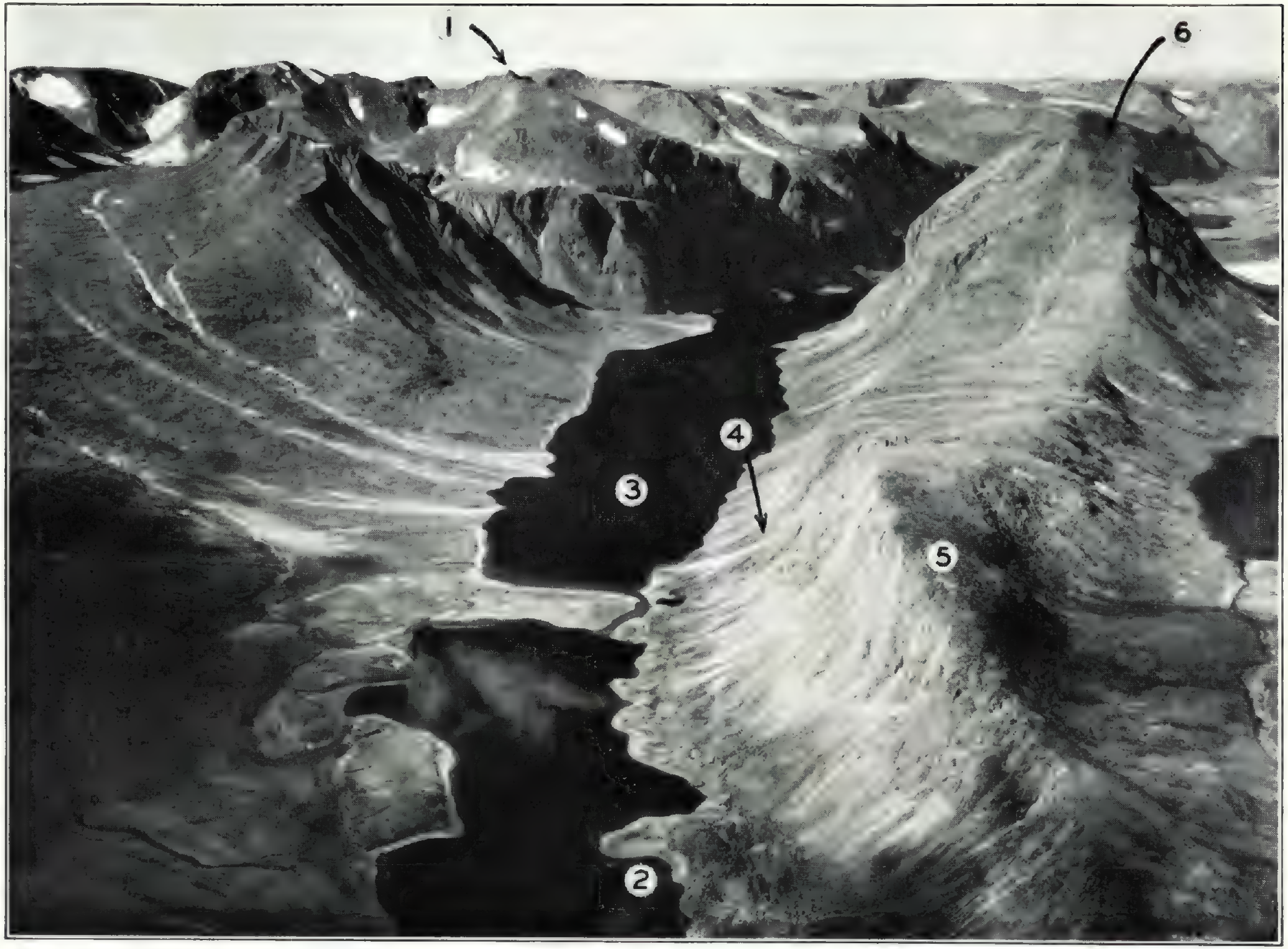
[2] Porsild, M. P. On some Herbaria from Greenland and Labrador collected by the Moravian Brethren. Meddel. om Grønl., xciii. no. 3, 84–94 (1935).

[3] Fernald, M. L. and Sornborger, J. D. Some recent Additions to the Labrador Flora. Ottawa Naturalist, xiii. 89–107 (1899).

[4] Low, A. P. Report on explorations in the Labrador Peninsula. Geolog. Surv. Can., pt. L, Ann. Rept., n. s., viii. 1–43 (1896).

[5] Delabarre, E. B. Report of the Brown-Harvard Expedition to Nachvak, Labrador in the year 1900. Bull. Geogr. Soc. Phila., iii. 65–212 (1902).

[6] Woodworth, R. H. Interesting Plants of Northern Labrador. Rhodora, xxix. 54–57 (1927).



Aerial View of Komaktorvik Lake from the East, 1931 (*courtesy of* Professor Alexander Forbes and The American Geographical Society). Fig. 1, X Peak; fig. 2, the Camp Site; fig. 3. Komaktorvik Lake; fig. 4, Scree Slide from Precipice Ridge to the Lake; fig. 5, Precipice Ridge; fig. 6, Precipice Mountain.

Bishop,[1] and Wetmore.[2] Of these, only Delabarre appears to have collected from higher altitudes, primarily on Mt. Faunce north of Nachvak. In general, then, the flora of the east coast of Labrador at the lower elevations is by no means poorly known while that of the mountains has just barely been sampled. The significant phytogeographical features provided by the flora as then known are given by Professor Fernald in his memoir[3] on the persistence of plants in the unglaciated regions of North America.

B. General Objectives and Itinerary

It was with the idea of obtaining significant and representative plant-material especially from the higher altitudes in the Torngat and Kaumajet mountains that I represented the Gray Herbarium as botanist on the Grenfell-Forbes Expedition. Fortunately the summer of 1931 was unusually open, with but little snow even near the tops of the mountains (see Plates 408, 409, 411). Judging from the accounts of other expeditions to northeastern Labrador it is doubtless the occasional summer snow storms on the mountains which discouraged extensive collecting from them. In addition, the tradition had become well established that the mountains of northeastern Labrador are very high and difficult to climb.[4] This is by no means the case, as the writer found under the skilful guidance of Mr. Odell.

While intensive collecting from the higher elevations was kept in view as the main objective, collections were made elsewhere as opportunity arose, with especial emphasis on the *Gramineae*, *Carex*, *Salix* *Draba*, *Arnica*, *Antennaria*, and *Taraxacum*.

The botanical collecting was done on thirty different days between June 28th and August 30th, although these were not always full collecting days, since the exigencies of travel often left for botanizing only the short time between making harbor and dusk. More time was available at the main centers of collecting which were at Ikordlearsuk, Kangalaksiorvik (Plate 408), Komaktorvik (Plate 408), Komaktorvik Lake (Plate 409), and the Mugford region (Plates 410 and 411). General descriptions of the course of the expedition have

[1] Bishop, H. The Austin Collection from the Labrador Coast. Rhodora, xxxii. 59–62 (1930).

[2] Wetmore, R. H. Plants of Labrador. Rhodora, xxv. 4–12 (1923).

[3] Fernald, M. L. Persistence of Plants in Unglaciated Areas of Boreal America. Memoirs of the Gray Herbarium of Harvard University. II. (1925).

[4] Bent, A. H. The Unexplored Mountains of North America. Geogr. Rev., vii. 403. (1919).

Locality	Date		Latitude	
			°	′
Ikordlearsuk Mountain		Aug. 14	60	02
East Bay, Ikordlearsuk ("Ekortiarsuk")	Aug. 12		59	59
Ryan's Bay	Aug. 10		59	35*
"Peak 19, The Four Peaks"	Aug. 4		59	28
"Near Island" (Amiktok Island), Seven Islands Bay, Kangalaksiorvik (11, Pl. 408)	Aug. 6		59	25
North Shore of Kangalaksiorvik[1]	Aug. 4		59	24
South Shore of Kangalaksiorvik (Seaplane Cove) (8, Pl. 408)	Aug. 6 July 22	Aug. 16	59	23
"Valley of the Bryant Lakes," Kangalaksiorvik (9, Pl. 408)		Aug. 16	59	21
Mount Tetragona (7, Pl. 408)	July 26		59	19
"K-2 Mountain," north shore of Komaktorvik (2, Pl. 408)	July 24		59	18
"Valley of the K River" (3, Pl. 408)	July 22, 24		59	18
Valley of the Komaktorvik River (4, Pl. 408)	Aug. 1		59	14
Razorback Harbor		Aug. 17	59	12
"Precipice Ridge" (5, Pl. 409)	July 29		59	11
"Precipice Mountain" (6, Pl. 409)	July 29		59	10
Komaktorvik Lake (3, Pl. 409)	July 30		59	10
"X Peak" (1, Pl. 409)	July 30		59	08
Nachvak		Aug. 18	59	05
Rowsell Harbor	July 20		58	58
Kikkertaksoak Island, Saglek Bay		Aug. 19	58	34
The Bishop's Mitre (3 and 4, Pl. 411)		Aug. 21	57	36
Ogualik Island (5, Pl. 410, and 2, Pl. 411)		Aug. 21	57	56*
"Valley of the Twin Falls," Cape Mugford (4, Pl. 410)	July 17		57	50*
Nain		Aug. 23	56	33*
Kikkivitak Island, Ittekaut Bay		Aug. 24	56	21*
Hopedale	July 13		55	26
Aillik	July 10		55	09
Indian Harbor	July 8		54	25
Gready Island	July 5, 6		53	48*
Hawkes Island	July 4		53	05
Battle Harbor	July 3	Aug. 30	52	19
St. Anthony, Newfoundland	June 30 July 1		51	21
Keppel Island, Ingornachoix Bay, Newfoundland	June 28		50	40*

Names in quotation-marks are provisional for localities otherwise lacking accepted designations.

Latitudes, unless marked (*), have been checked through the kindness of Mr. O. M. Miller of the American Geographical Society and supersede the latitudes given on the plant-labels, where these differ.

been given by Dr. Forbes elsewhere,[2] but since the activities of the various members of the expedition were often diverse, the preceding

[1] Kangalaksiorvik is the Komaktorvik of Coleman (l. c.).

[2] Forbes, A. Surveying in Northern Labrador. Geogr. Rev., xxii. 30–60 (1932).

———. An aerial Survey in Northern Labrador. Harvard Alumni Bulletin, 917–923 (1932).

———. A Northern Labrador Cruise. Yachting, liii., nos. for March, April and May (1933).

schedule has been prepared to indicate the dates when collections were made at the different stations, and the latitudes of these stations. By reading up the left-hand column of dates and down the right-hand column a general idea of the itinerary may be gained. The arrangement of the stations in a linear succession from north to south has thrown the dates out of the order because of the trip made inland to Komaktorvik Lake late in July.

c. General Considerations concerning the Flora of Northeastern Labrador

Excellent general descriptions of the flora of northeastern Labrador are to be found in the works of Delabarre,[1] Low,[2] Coleman,[3] and others. As pointed out by Macoun and Malte,[4] the northern part of Labrador is in the Arctic zone of Canada. The southern extent of this zone in northeastern Labrador is determined by tree-line, and, as Low (l. c., p. 30) describes it from his personal observations, this extends from about the mouth of the George River on Ungava Bay turning south-southeast just west of the Torngats and runs more or less parallel to the east coast of Labrador to about Hebron where trees first appear near the coast. Really continuous forest does not come out to the coast until much farther south.[5] An opportunity to check on the northern limit of trees near the mouth of the George River was afforded when I accompanied the photographic party on a flight from Kangalaksiorvik south to Nachvak, thence west to the mouth of the George River, north along the shore of Ungava Bay to the Button Islands, and south over the Torngats back to the base at Kangalaksiorvik. On the leg of this flight extending from Nachvak to the mouth of the George River especial watch was kept for any evidence of trees. From the altitude (about 5,000 to 6,000 feet) at which the flight was made, the most striking feature, because of its rarity, was the occurrence of any color other than the gray of the apparently bare land-surface or the blue of the numerous lakes Two general shades of green stood out in this way. Much restricted areas of a yellowish

[1] Delabarre, l. c., p. 167–206; see also Delabarre's chapter on the Flora of Labrador in Grenfell, W. Labrador. New York (1913).

[2] Low, A. P. l. c.

[3] Coleman, A. P., l. c. p. 16–18.

[4] Macoun, J. M. and Malte, M. O. The Flora of Canada. Can. Dept. Mines, Geol. Surv. Museum Bull, no. 26 (1917).

[5] For a description of the wooded conditions near Nain see: Wheeler, E. P., 2nd. Journeys about Nain. Geogr. Rev. xx. 454–468 (1930).

green characterized the heads of the larger lakes in the central range of the Torngats, which experience on the ground indicated was due to grassy, meadow-like areas with occasional willow and alder thickets. But in the rolling hills of the lowland west of the Torngats this yellow-green gave way to a blue-green in the moist, protected heads of lakes. This color may well be interpreted as representing restricted groves of conifers (presumably larch and spruce), especially since the only shadows (other than those caused by the mountains) which were noted on the flight were cast by scattered individuals at margins of such "groves." This substantiates Low's observations. It would seem that the tree line[1] comes a few miles north of the mouth of the George River in the rolling lowlands west of the Torngats. It is then deflected south at least as far as Nachvak in the central range of the Torngats.

From the air there was no evidence of vegetation other than at the heads of lakes. The predominant colors were varying shades of darker gray where the snow had been absent for longer periods of time, and a harsh, light gray where the snow or ice had just recently melted (as indicated by the presence of snow-banks immediately adjacent to many such areas). Closer investigation had already shown that these harsh, light gray areas were generally devoid of vegetation, since apparently they were exposed only when the summer was as *relatively* mild as during the season of 1931.

The greater part of the ice- and snow-free country (which appeared a warmer gray from the air) is covered, especially at the lower elevations, with the ubiquitous tundra, the flora of which is well known. Where the drainage is too good for vascular plants to flourish, lichens and, to a less extent, mosses thrive, while in the moister areas they form the background for the vascular plants. Wherever there is just sufficient moisture for the more hardy vascular plants to exist, an occasional *Hierochloë alpina*, *Luzula confusa* or *Cardamine bellidifolia* will manage to survive. Sometimes only one or two of such plants are to be found on the fragment of an old peneplain forming the summit of a higher mountain. The flora of these mountain tops is indicated in detail in Table I. At lower altitudes, on the ridges or upper slopes of the mountains, a richer flora appears (see Table II) but the hardy species occurring on the mountain tops are present again at these lower elevations, plus some of the fairly hardy plants from below.

[1] Or at least the northern limit of the ecotone between forest and tundra.

Similarly on talus-slopes and in gullies (see TABLE III) one finds most of the plants of the mountain tops and higher slopes, with the addition of some of the ubiquitous tundra species. Then near sea-level there is the richest flora, including most of the hardy species from higher levels plus the tundra, strand, meadow, or outwash-plain species, depending on the combination of environmental circumstances. The striking feature of the flora is the absence of a clear-cut altitudinal separation of the hardier species. The plants of the mountain tops are to be found in the proper habitats all the way practically to sea-level. Nor is this an isolated observation on the behavior of arctic plants; Raup[1] remarks on it with reference to the appearance of arctic species at river-level in the Canadian Rockies; Devold and Scholander[2] observed it in Southeast Greenland; Simmons[3] notes that altitude is of little very consequence in Ellesmereland.

An interesting sidelight on the ability of plants to survive under adverse conditions is provided by an analysis of the species growing on the margins of soil polygons. The best developed soil polygons[4] were found on Ikordlearsuk Mountain and on the upper ridge above the Valley of the Twin Falls at Cape Mugford. The polygons rarely occur singly, and more commonly are in groups, each individual crowded closely against its neighbor. The polygons are cauldron-like areas about three feet in diameter with finely comminuted country rock slowly churning about vertically under the influence of frost-action.[5] In the most active portions of these polygons, at their centers, no plants of any kind occur, but at their margins, where the rock-fragments are somewhat larger, a few hardy species of plants manage to maintain a foothold. This flora was relatively rich at the Mugford locality where the following species of plants occurred on the margins of the polygons: *Carex misandra, Salix herbacea, Salix Uva-ursi, Papaver radicatum, Arenaria sajanensis, Sagina nivalis, Cardamine bellidifolia, Draba nivalis* and *Vaccinium Vitis-Idaea* var. *minus*. At

[1] Raup, H. M. Phytogeographic Studies in the Peace and Upper Liard River Regions, Canada. Contr. Arnold Arboretum, Harvard Univ. No. VI, 63 (1934).

[2] Devold, J. and Scholander, P. F. Flowering Plants and Ferns of southeast Greenland. Skrifter om Svalbard og Ishavet. No. 56, 170 (1933).

[3] Simmons, H. G. The Vascular Plants in the Flora of Ellesmereland. Rep. Sec. Nor. Arc. Exp. "Fram" 1898–1902. No. 2, 8 (1906).

[4] For further mention of these see Odell, l. c.

[5] For a consideration of the mechanics of soil polygons see:

Huxley, J. S. and Odell, N. E. Notes on surface Markings in Spitsbergen. Geogr. Jour., lxiii. 207–229 (1924).

Elton, C. S. The Nature and Origin of Soil-polygons in Spitsbergen. Quart. Jour. Geol. Soc. London, lxxxiii. 163–194 (1927).

the much more northerly station of Ikordlearsuk, the soil polygons on the first summit (alt. ca. 2250 ft.) of Ikordlearsuk Mountain had only *Luzula confusa* and *Cardamine bellidifolia* growing very sparingly at their margins; while on the second peak (alt. ca. 2800 ft.) *Poa glauca, Luzula confusa,* and *Papaver radicatum* occurred, but no *Cardamine bellidifolia.*

Seidenfaden[1] in a study of the plants characteristic of moving soils in East Greenland found that the plants "very seldom have time and power to flower." This was not the case with plants growing on the margins of soil polygons in northeastern Labrador. In his discussion he does not distinguish clearly between areas where vertical movement of the soil predominates, as in the case of soil polygons, and areas where a horizontal motion of the soil is combined with a vertical component as the result of solifluction on slopes. It is difficult, therefore, to compare his observations on the flora of soil polygons in East Greenland with my own in Labrador, but it would appear that in East Greenland a larger number of species occur in such habitats. The general problem of plants in relation to moving soils is a phase of arctic and alpine ecology which is deserving of more attention than it has yet received.

Indicative of the major significance of water in the success of plants at higher altitudes was the presence on a narrow, barren, dry ridge leading toward the higher slopes of the Bishop's Mitre (see Pl. 411) of an exceptional and restricted, moist, mossy area not more than three feet across, with the following species covering it: *Poa glauca, Oxyria digyna, Cerastium alpinum* var. *glanduliferum, Ranunculus pygmaeus, Saxifraga rivularis.* There were numerous stunted individuals of each species closely crowded together, forming a very small segment of meadow-like appearance. It was strikingly different from the occasional widely scattered individuals composing the flora elsewhere at the higher levels and especially for this particular ridge which was otherwise as bare as a city pavement.

d. Flora of higher Elevations and Comparison with contemporary Greenland Nunataks

The results of the major object of the collecting, namely that from higher elevations, is summarized in Tables I, II, and III, the first listing plants found directly on the tops of the mountains; the second,

[1] Seidenfaden, G. Moving Soil and Vegetation in East Greenland. Meddel. Grøn., lxxxvii, no. 2, 1–21 (1931).

those growing on the higher slopes of the mountains and on the tops of the higher ridges; and the third, those of the moist slopes, gullies, or on scree (talus). Included under the heading Arctic America are stations on James Bay and the southwest coast of Hudson Bay which, strictly speaking, are not arctic.

The fact which immediately stands out is the absence of vascular plants from the tops of the two highest mountains investigated, Mt. Tetragona and "X" peak, both in the Torngats. Both of these mountains, however, have a number of lichens and some mosses growing on their tops. The balance of the mountain summits have a decidedly limited flora, the number of individual species depending partly on altitude, partly on latitude, and partly on proximity to the coast. In general the species observed fall into two groups. The first group is composed of plants of a wide arctic distribution, which extend south at least into the Gulf of St. Lawrence region. The second group consists of those arctic species which reach their southernmost limit in Labrador. The members of a very small third group are not known from western America, namely *Cassiope hypnoides*, which is otherwise of wide arctic dispersal (including arctic Eurasia) and occurs in eastern America as far south as alpine habitats of the New England mountains, and *Antennaria angustata*, which appears to be restricted to eastern arctic and subarctic America. In general, then, these plants are of wide arctic distribution. Altitudinally they are not restricted to the mountain tops, but as a consultation of the second part of this paper will show, they occur freely also at the lower levels. It is evident that it is only the hardier members of the flora which are able to survive the severe environment of the higher mountain tops which form isolated portions of the old northeastern Labrador peneplain.

On the higher mountain slopes and tops of ridges (Table II), a larger number of species exists. Many of these, as might be expected, are the same as occur on the tops of the higher mountains. The greater number of species fall into the same categories as those indicated for Table I. In addition there is a small group not known from the northern coast of the American continent west of the Melville Peninsula. These are *Cassiope hypnoides, Antennaria angustata* and *A. hudsonica*. Practically all the species which occur at the higher elevations in the Torngat and Kaumajet Mountains are therefore either ubiquitous arctic forms or at least occur in the Arctic of eastern America.

TABLE I

PLANTS COLLECTED ON MOUNTAIN TOPS IN NORTHEASTERN LABRADOR

Occurrence in northern part of western hemisphere[1]						Torngat Region						Kaumajet Region		
Rocky Mountains and (or) Alaska	Arctic America (incl. Hudson Bay)	Arctic Archipelago	Greenland	Gulf of St. Lawrence Region		Ikordlearsuk Mt.—1st Summit	Ikordlearsuk Mt.—2nd Summit	Mt. Tetragona	"K-2" Mountain	Precipice Mountain	"X" Peak	Bishop's Mitre—East Summit	Bishop's Mitre—West Summit	Odell's Peak west of Bishop's Mitre
					Altitude in feet→	2250[2]	2800	4420	2466	3670	4575	3750	3700	3620
X	X	X	X	X	Lycopodium Selago var. appressum				X					
X	X	X	X	X	Hierochloë alpina				X					
X	X	X	X	X	Poa glauca		X			X				X
X	X	X	X	O	P. arctica				X			X		
X	X	X	X	X	Festuca brachyphylla				X					
X	X	X	X	X	Carex scirpoidea				X					
X	X	X	X	X	Luzula confusa	X	X		X	X		X	X	X
X	X	X	X	X	L. spicata				X					
X	X	X	X	O	Papaver radicatum		X						X	
X	X	X	X	X	Cardamine bellidifolia	X				X		X	X	
X	X	X	X	O	Draba fladnizensis var. heterotricha								X	
X	X	X	X	X	Saxifraga rivularis					X			X	
X	X	X	X	X	S. cernua								X	
X	X	X	X	O	Cassiope tetragona				X					
O	O	X	X	X	C. hypnoides				X					
X	X	X	X	X	Vaccinium Vitis-Idaea var. minus				X					
O	O	X	X	O	Antennaria angustata				X					
					Mosses and lichens only			X			X			

[1] For foot-notes 1 and 2 see p. 117.

The only other detailed record of the plants which occur at higher elevations is that of Delabarre. He notes the species[3] which he collected on Mt. Faunce (north of Nachvak) between 3500 feet and the top, 4400 feet, as the following: "Papaver nudicaule," "Draba fladnitzensis," "Cerastium alpinum," "Luzula confusa," "Saxifraga caespitosa," "S. rivularis," "S. nivalis," and "Sedum?". This record of a *Sedum* is questionable, and it is probable that something else was mistaken for it. Otherwise the species reported are in close agreement with these which I collected on other mountains of the region. Delabarre's description[4] of his collecting on Mt. Faunce is so felicitous that I quote portions of it, "The height here was 3,400 feet . . . Thence we went up a series of not very difficult slopes along an exceedingly narrow ridge . . . The surface was of finely broken stone. A very little scattered vegetation grew on it, and this was almost exclusively moss and lichen, with occasional individual small plants of grass and very rarely a small flowering plant. Of the latter I found not more than half a dozen varieties." And in a subse-

Foot-notes 1 and 2 from Table I:

[1] Errors of omission and commission are difficult to avoid in compiling a table of distribution such as this and the corresponding ones for Tables II and III. In preparing these tables the collections of the Gray Herbarium, taxonomic revisions of certain groups, and the following general works have been utilized:—

Fernald, M. L. Persistence of Plants in Unglaciated Areas of Boreal America. Mem. Gray Herb. of Harvard Univ. II. (1925), repr. from Mem. Amer. Acad. Arts and Sci., xv. 239–342 (1925); also numerous taxonomic revisions and phytogeographical papers appearing in Rhodora by the same author.

Holm, Theo. Contributions to the Morphology, Synonymy and Geographical Distribution of Arctic Plants. Report of the Can. Arct. Exp., 1913–18. v. pt. B. (1922).

Lewis, H. F. An annotated List of Vascular Plants collected on the North Shore of the Gulf of St. Lawrence. Can. Nat. xlv. 129–135, 174–179, 199–204, 225–228; xlvi. 12–18, 36–40, 64–66, 89–95 (1931 and 1932).

Ostenfeld, C. H. The Flora of Greenland and its Origin. Kgl. Danske Vidensk. Selsk., Biol. Medd. vi, no. 3 (1926).

Raup, H. M. Phytogeographic Studies in the Peace and Upper Liard River Regions, Canada. Contr. Arnold Arb. Harvard Univ. no. VI, 1–230 (1934).

Simmons, H. G. Vascular Plants of Ellesmereland. Second Arct. Exp. "Fram," 1898–1902, no. 2 (1906); and also his Phytogeography of the Arctic American Archipelago. Lunds Univ. Arsskr. N. F. pt. 2, ix, no. 19 (1913).

[2] Barometrically determined altitude. The other altitudes are based on the survey conducted in the course of the season of 1931 by Mr. O. M. Miller of the American Geographical Society, and were kindly furnished by him.

[3] In the list of plants which he gives in his Report of the Brown-Harvard Expedition to Nachvak, Labrador 1900, Bull. Geogr. Soc. Phila., iii. 177 et seq. (1902), the nomenclature of the species from Mt. Faunce is not very sure. However in his chapter on the plants of Labrador in Grenfell, W. T., Labrador, New York (1913), page 412, he seems to understand the species somewhat more clearly, and it is primarily from the latter that the species are quoted.

[4] l. c.

TABLE II

PLANTS COLLECTED ON MOUNTAIN SLOPES AND ON THE TOPS OF RIDGES IN NORTHEASTERN LABRADOR

Occurrence in northern part of western hemisphere[1]						Torngat Region							Kaumajet Region			
Rocky Mountains and (or) Alaska	Arctic America incl. Hudson Bay	Arctic Archipelago	Greenland	Gulf of St. Lawrence Region		Ridge S. of East Bay, Ikordlearsuk	Tetragona, spur on S. W. side	"K-2"—near the summit	"K-2"—lower slopes	Precipice Mt.—N. E. shoulder	Precipice Ridge	Razorback Harbor, ridge on N. side	Bishop's Mitre—upper slopes	Bishop's Mitre—ridge leading to upper slopes	Mugford peninsula—upper ridge	Mugford peninsula—lower ridge
					Approximate altitude in feet→	1720	3500	2000	1500	3000	1910	2000	3500	2750	2500	1800
X	X	X	X	X	Lycopodium Selago var. appressum	X										
X	X	X	X	X	Hierochloë alpina	X					X	X				
X	X	X	X	O	Phippsia algida				X							
X	X	(X)[2]	X	X	Trisetum spicatum var. Maidenii									X		
X	X	X	X	X	Poa alpina								X			
X	X	X	X	X	P. glauca		X					X		X		
X	X	X	X	X	Festuca brachyphylla							X				
X	X	X	X	X	Carex capillaris			X								
X	X	X	X	O	C. misandra								X			X
X	X	X	X	X	C. concolor	X					X	X				
X	X	X	X	X	Luzula confusa	X					X	X			X	
X	X	X	X	X	L. spicata							X				
X	X	O	O	X	Salix vestita								X			
O	X	X	X	X	S. Uva-ursi						X				X	
O	X	X	X	X	S. herbacea										X	

TABLE II—*Continued*

PLANTS COLLECTED ON MOUNTAIN SLOPES AND ON THE TOPS OF RIDGES IN NORTHEASTERN LABRADOR

Occurrence in northern part of western hemisphere[1]						Torngat Region							Kaumajet Region			
Rocky Mountains and (or) Alaska	Arctic America incl. Hudson Bay	Arctic Archipelago	Greenland	Gulf of St. Lawrence Region		Ridge S. of East Bay, Ikordlearsuk	Tetragona, spur on S. W. side	"K-2"—near the summit	"K-2"—lower slopes	Precipice Mt.—N. E. shoulder	Precipice Ridge	Razorback Harbor, ridge on N. side	Bishop's Mitre—upper slopes	Bishop's Mitre—ridge leading to upper slopes	Mugford peninsula—upper ridge	Mugford peninsula—lower ridge
					Approximate altitude in feet→	1720	3500	2000	1500	3000	1910	2000	3500	2750	2500	1800
X	X	X	X	(X)	Salix anglorum								X			
X	X	X	X	X	Oxyria digyna									X		
X	X	X	X	X	Silene acaulis var. exscapa			X								
X	X	X	X	O	Lychnis furcata			X								
O	X	X	X	X	Cerastium alpinum var. glanduliferum							X		X		
O	X	O	X	X	C. alpinum var. lanatum					X						
X	X	X	X	X	Arenaria verna var. pubescens								X			
X	X	X	X	X	Arenaria sajanensis							X	X		X	X
O	X	X	X	X	Sagina nivalis										X	
X	X	X	X	X	Ranunculus pygmaeus	X	X							X		
X	X	X	X	O	Papaver radicatum				X						X	X
X	X	X	X	X	Cardamine bellidifolia				X			X			X	
X	X	X	X	O	Draba fladnizensis var. heterotricha		X		X			X	X			
O	O	O	X	X	D. rupestris		X						X		X	
X	X	X	X	X	D. nivalis		X								X	
X	X	X	X	O	Arabis arenicola		X		X				X			

Table II—*Continued*

Plants collected on Mountain Slopes and on the Tops of Ridges in Northeastern Labrador

Occurrence in northern part of western hemisphere[1]						Torngat Region							Kaumajet Region			
Rocky Mountains and (or) Alaska	Arctic America incl. Hudson Bay	Arctic Archipelago	Greenland	Gulf of St. Lawrence Region		Ridge S. of East Bay, Ikordlearsuk	Tetragona, spur on S. W. side	"K-2"—near the summit	"K-2"—lower slopes	Precipice Mt.—N. E. shoulder	Precipice Ridge	Razorback Harbor, ridge on N. side	Bishop's Mitre—upper slopes	Bishop's Mitre—ridge leading to upper slopes	Mugford peninsula—upper ridge	Mugford peninsula—lower ridge
					Approximate altitude in feet→	1720	3500	2000	1500	3000	1910	2000	3500	2750	2500	1800
X	X	X	X	X	Saxifraga rivularis									X		X
X	X	X	X	X	S. cernua								X			
X	X	X	X	X	S. caespitosa	X	X							X		
X	X	X	X	0	S. nivalis		X									
X	X	X	X	X	S. oppositifolia			X					X			
X	X	X	X	X	Dryas integrifolia											X
0	0	X	X	X	Cassiope hypnoides											X
X	X	X	X	X	Vaccinium Vitis-Idaea var. minus						X					
(X)	X	X	X	X	Campanula rotundifolia							X				
X	X	X	X	0	Erigeron unalaschkensis								X			
0	X	X	0	0	Antennaria hudsonica	X										
0	X	X	X	0	A. labradorica (?)					X						
0	0	X	X	0	A. angustata		X					X				
X	X	X	X	X	Taraxacum lacerum							X				
X	X	X	0	X	Crepis nana											X

[1] See corresponding footnote to Table I.

[2] Parentheses indicate that the species *in sensu lato* is known from the region represented by the column.

quent paragraph he says: "The material of the mountain is the same as that of which most of Labrador is formed: mainly hornblende gneiss, cut here and there by dykes of darker trap. The summit is of almost knife-like sharpness and very jagged." (This is often the case but not universal in the Torngat Mountains.) "It is nearly level for about a hundred yards . . . and goes down by a series of steps to the valley." The level top referred to is doubtless a portion of the old peneplain.

The vegetation of the present-day nunataks and mountains of Greenland presents a significant yard-stick for the appraisal of the plants growing at higher levels in northeastern Labrador. Before considering the flora of nunataks it is well to have in mind a clear idea of what is meant by the term nunatak. Among geologists it is considered to be a hill or mountain surrounded by an ice-sheet. This necessitates that it be of relatively restricted area; that it be *above* the ice and thus exposed to the winds and storms sweeping across the ice-fields; and being *above* the ice, that the available water supply be very slight since all melt-water from the ice below is unavailable to it; inherent in its nature as a hill or a mountain top, it would have excellent drainage. All these factors combine to provide an area which ecologically is unfavorable for any but the hardiest plants, because of the sterile and well-drained nature of the soil, and because such a locality partakes of the rigorous climate of the ice-cap.

In Greenland, Böcher[1] mentions as the only plant which he found on a nunatak at Kangerdlugssuak (East Greenland, lat. about 68° N.) *Papaver radicatum*. At Cape Deichman (East Greenland, lat. about 68° N.) he found the following plants on a nunatak, "*Salix arctophila* × *glauca, S. herbacea, Empetrum, Vaccinium, Oxyria, Polygonum, Cerastium alpinum, Silene acaulis, Ranunculus glacialis, Saxifraga oppositifolia, Poa glauca,* and *Luzula confusa.*"

Devold and Scholander[2] note the following species on a rocky plateau, The Brandalfjaell, at Kangerdlugssuak (altitude of about 3476 feet): *Luzula confusa, Papaver radicatum, Silene acaulis, Saxifraga rivularis,* and *Poa glauca;* with the following, in addition, at the margin of the plateau: *Hierochloë, Poa arctica, Luzula spicata, Potentilla emarginata, Phippsia algida,* and *Empetrum.* On Møretind (alt.

[1] Böcher, T. W. Studies on the Vegetation of the East Coast of Greenland between Scoresby Sound and Angmagssalik. Medd. Grønl. civ, no. 4 (1933).

[2] Devold, J. and Scholander, P. F. Flowering Plants and Ferns of Southeast Greenland. Skrifter on Svalbard og Ishavet, no. 56 (1933).

about 3936 ft., lat. about 60° 30′ N., in Southeast Greenland) they found *Lycopodium Selago, Cardamine bellidifolia, Silene acaulis, Salix herbacea, Cassiope hypnoides, Antennaria "alpina," Juncus trifidus, Luzula confusa, Luzula spicata, Carex concolor* (*C. rigida*), *Agrostis borealis*. The authors note that these are all (except *Cardamine bellidifolia* and *Luzula confusa*) species of lower elevations in that part of Greenland, a striking parallel to conditions in northeastern Labrador, where, however, even *Cardamine bellidifolia* and *Luzula confusa* are present in the lowlands.

Ostenfeld[1] considers that of the eight species on Midgaardsorm, a nunatak at about 81° N. near the north coast of Greenland, 3 are high-arctic and the other 5 are arctic species. He describes three other nunataks in southern West Greenland (lat. about 63° N.), each with 26 or 27 species and a total flora of 54[2] species. Of these 54 species, 40 are arctic, 3 high-arctic, and only 11 subarctic and boreal. He characterizes the plants occurring on nunataks in Greenland as the hardiest part of the Greenland flora. These widely distributed "glacial species" he thinks are those most likely to have lived through the period of maximum glaciations in Greenland.

Simmons[3] (p. 142) says "the present flora of nunataks and other areas of habitable ground hardly speaks in favour of looking on the main of the Greenland flora as preserved in that way" (namely on nunataks). He goes on to say ". . . we will have to look for such possible survivors only among the high arctic and most hardy species, but these again are generally circumpolar and thus are not apt to give any evidence for or against the hypothesis of persistence." Similarly the species on the mountains of northeastern Labrador are of general arctic or subarctic occurrence. As a result they do not provide positive evidence concerning the glacial history of the mountains. If the upper slopes and tops of the mountains were ice-covered during the Wisconsin, it is these hardy, "aggressive" species which would be expected to follow the retreating ice to the summits of the mountains. On the other hand, if these mountain tops existed as nunataks during the Wisconsin, it is again these "glacial species," as

[1] Ostenfeld, C. H. The Flora of Greenland and its Origin. Kgl. Danske Vidensk. Selskab., Biol. Medd. vi, no. 3 (1926).

[2] For an idea of the flora of such nunataks in East Greenland see the list of plants collected by Bjørlykke on Nordenskiolds Nunatak, in Devold and Scholander, l. c. p. 172.

[3] Simmons, H. G. Phytogeography of the Arctic American Archipelago. Lunds Univ. Arsskr. N. F. pt. 2, ix, no. 19 (1913).

Ostenfeld calls them, which would persist the longest under such adverse environmental conditions. Thus the plants of the higher elevations are of such a character that they contribute no positive evidence toward the solution of the problem of whether the Wisconsin ice completely inundated the mountains. But there still remains the fact that plants of cordilleran affinities occur elsewhere in Labrador.

In Table III are listed species which occur on moist slopes, in gullies, and on scree-slopes in northern Labrador. Here again the great majority of the species represented in Tables I and II are present. There are also some species in addition, primarily those requiring moister habitats. Also it should be noted that most of the habitats treated in this table are at relatively low elevations. Of the species mentioned in Table III, only *Cerastium Beeringianum* stands out as having a disrupted range, in the strictest sense of the term. Another example of this type of distribution is *Arenaria humifusa* (*A. cylindrocarpa*), which was collected during the summer of 1931, but is not listed in Table III because it was found practically at sea-level.

This brings us to a consideration of species characterized by disrupted ranges. Notable for this among all other species of the northeastern Labrador flora is *Carex filifolia* Nutt. which was collected in 1900 at Nachvak by Delabarre.[1] This western plant is as yet unknown elsewhere than at this station in eastern North America. It also seems to be the only species yet known from Labrador with this type of distribution. This statement requires some explanation since Professor Fernald (p. 316)[2] gives a somewhat longer list of such plants. In the ten years which have passed since the publication of his memoir, changes in taxonomic concepts and further exploration have modified our knowledge of the species which he mentions in this category. His *Draba stenoloba* is now interpreted[3] as *D. Sornborgeri* Fernald a new species endemic in Labrador. *Pedicularis groenlandica* Retz. is now known not only from northeastern Labrador and the Rocky Mountains, but also from James Bay and Port Harrison on Hudson Bay, Saskatchewan and the Athabaska drainage. *Petasites sagittata* (Pursh) Gray has been collected at James Bay and Fort Albany on Hudson Bay, and also occurs in Minnesota, Manitoba,

[1] l. c.

[2] Fernald, M. L. Persistence of Plants in Unglaciated Areas of Boreal America. Mem. Gray Herb. Harvard Univ. II (1925).

[3] Fernald, M. L. Draba in temperate northeastern America. Rhodora xxxvi. 319–321 (1934).

TABLE III

PLANTS COLLECTED ON MOIST SLOPES, IN GULLIES, AND ON SCREE-SLOPES IN NORTHEASTERN LABRADOR

Rocky Mountains and (or) Alaska	Arctic America incl. Hudson Bay	Arctic Archipelago	Greenland	Gulf of St. Lawrence Region	Approximate altitude in feet→	N. side of ridge on S. side of East Bay, Ikordlearsuk 1400	Scree on S. side of Peak 19, The Four Peaks 2750	Old scree, Valley of Bryant Lakes 200	Scree slide from Precipice Ridge 1300	Moist gully in cliff, N. side of Razorback Harbor 1900	Gully from Valley of Twin Falls to lower ridge, Mugford, Peninsula 1400
X	X	X	X	X	Woodsia ilvensis			X		X	X
X	X	X	X	X	W. glabella						X
X	X	X	X	X	Cystopteris fragilis			X			X
X	X	X	X	X	Agrostis borealis				X		
X	X	(X)[1]	X	X	Trisetum spicatum var. Maidenii					X	
(X)	(X)	(X)	(X)	X	T. spicatum var. pilosiglume				X		
X	X	X	X	X	Poa glauca				X		
X	X	O	X	X	P. alpigena				X		
X	X	X	X	X	Festuca brachyphylla				X		
X	X	X	X	X	Carex bipartita		X				
X	X	X	X	X	C. scirpoidea					X	
X	X	X	X	X	Luzula spicata				X		
X	O	O	X	X	L. campestris var. frigida					X	
X	X	X	X	X	Tofieldia minima						X
X	(X)	(X)	(X)	X	Salix anglorum var. araioclada		X				
X	X	X	X	X	Oxyria digyna						X
X	X	X	X	O	Lychnis furcata	X		X			
O	O	O	X	X	L. alpina					X	
X	O	O	O	X	Cerastium Beeringianum					X	
O	O	O	X	X	Cerastium cerastioides				X	X	
X	X	X	X	X	Arenaria verna var. pubescens		X				
X	X	X	X	X	A. sajanensis	X					
O	X	X	X	O	Ranunculus nivalis	X					

[1] Parentheses indicate that the species *in sensu lato* is known from the region represented by the column.

Table III—*Continued*

Plants collected on Moist Slopes, in Gullies, and on Scree-slopes in Northeastern Labrador

Rocky Mountains and (or) Alaska	Arctic America incl. Hudson Bay	Arctic Archipelago	Greenland	Gulf of St. Lawrence Region		N. side of ridge on S. side of East Bay, Ikordlearsuk	Scree on S. side of Peak 19, The Four Peaks	Old scree, Valley of Bryant Lakes	Scree slide from Precipice Ridge	Moist gully in cliff, N. side of Razorback Harbor	Gully from Valley of Twin Falls to lower ridge, Mugford, Peninsula
					Approximate altitude in feet→	1400	2750	200	1300	1900	1400
X	X	X	X	X	Cardamine bellidifolia	X	X				
X	X	X	X	O	Draba fladnizensis var. heterotricha	X			X		
X	X	X	X	X	D. nivalis			X			
X	X	X	X	O	Arabis arenicola						X
O	X	X	X	X	A. alpina						X
X	X	X	X	X	Saxifraga rivularis	X					
X	X	X	X	X	S. cernua		X				X
X	X	X	X	X	S. caespitosa						X
X	X	X	X	X	S. stellaris var. comosa	X					
X	X	X	X	O	S. nivalis	X	X				
X	X	X	X	X	S. aizoides					X	
X	X	X	X	O	S. tricuspidata					X	
X	X	X	X	X	S. oppositifolia						X
X	X	O	X	X	Parnassia Kotzebuei						X
X	X	X	X	X	Potentilla nivea						X
X	X	X	X	X	P. emarginata	X					
X	X	O	O	X	Solidago multiradiata					X	
O	O	X	O	O	Antennaria canescens					X	
O	O	X	X	O	A. angustata		X		X		
O	X	O	X	X	Gnaphalium supinum		X		X		
O	X	O	O	X	Arnica terrae-novae					X	
X	X	X	X	X	Taraxacum lacerum					X	
X	O	X	X	X	T. lapponicum					X	

Saskatchewan, and the Rocky Mountains. *Crepis nana* Richards. has since been collected in Newfoundland and is also known from the Arctic Archipelago and the Arctic Coast, as well as from the Rocky Mountains.

Thus *Pedicularis groenlandica* and *Petasites sagittata* fall in line with other species from Labrador which have "way stations" between their far eastern and far western localities somewhere in the central portion of the continent. Other examples of such Labrador plants (which also occur in the Gulf of St. Lawrence region) are *Danthonia intermedia* Vasey, *Aster foliaceus* Lindl., var. *frondeus* Gray, and *Solidago multiradiata* Ait.

On the basis of our present knowledge of their distribution, *Crepis nana* and *Taraxacum lacerum* occupy "way stations" along the northern coastal fringe of the continent. As further facts concerning the flora of the central portion of subarctic America become available, we may well expect these two apparently different routes to merge into one.

In view of the poorly explored nature of much of the region, both continental and coastal, between the Torngat Mountains of northeastern Labrador and the foothills of the Rockies, occasional records from this intervening area, such as for the species mentioned in the preceding paragraphs, assume more than usual significance. Thus, in the strictest sense of the term, the species mentioned above may not be considered to have disrupted ranges. However, this does not alter the fact that plants with such ranges exist in northeastern Labrador, notably *Carex filifolia*. Other cordilleran species with a somewhat wider distribution in eastern America in addition to their occurrence in northeastern Labrador are *Cerastium Beeringianum* Cham. & Schl., *Senecio pauciflorus*[1] Pursh, *Epilobium Drummondii* Hausskn. and *Arenaria humifusa* Wahlenb.

There is also a small number of endemics in northeastern Labrador (some of them occurring elsewhere in Labrador as well), including *Arnica Sornborgeri* Fernald, *Antennaria pygmaea* Fernald, *A. Sornborgeri* Fernald, *A. burwellensis* Malte, *A. congesta* Malte, *Taraxacum torngatense* Fernald, *Draba Sornborgeri* Fernald and *Poa labradorica* Steudel. These occur in notably "difficult" genera, whose plasticity is well known. Especially in *Arnica, Antennaria* and *Taraxacum,* which tend to set seed apogamously, any mutant forms fitted to their

[1] With an intermediate station at Fort Franklin, Mackenzie River.

environment might be expected to be perpetuated more readily than in plants setting seed in the usual fashion. These genera might well be considered to be among the first to "throw" recognizable new species. It is of interest, however, as Fernald says (l. c. p. 317), that these are "species with their affinities clearly with cordilleran plants." To what extent this similarity can be attributed to parallel mutations is a question of interest which needs further study for its solution.

E. Contemporary Climate and Relic Species

In considering the presence of unusual species in the flora of northeastern Labrador it is natural to look to the climate as a possible explanation. Coleman (l. c. page 9) gives a good description of some of the features of the climate of northeastern Labrador. As he points out, the climate is "more nearly arctic than its latitude." Hann[1] characterizes its climate as decidedly sub-arctic and on the north coast as arctic, as does Koeppe.[2]

A climatic factor which would appear to be of primary importance in plant distribution is temperature. Charts[3] illustrating temperature conditions are provided in FIGS. 2–5. It will be noted that the sea-level isotherms representing the winter mean temperatures of northern Labrador approximate those of northwestern Greenland and James Bay (FIG. 2); that the early spring mean temperatures are comparable to those in central West Greenland and the central portion of Hudson Bay (FIG. 3); that the summer mean temperatures are similar to those in southwestern Greenland and northern Hudson Bay (FIG. 4); and that the fall mean temperatures are essentially similar to the summer mean temperatures (FIG. 5). Perhaps the most significant of these charts from the botanical point of view is that for July (FIG. 4), because it gives us a picture of temperature conditions at the height of the growing season. But this does not provide a clear-cut explanation for the presence of unusual elements in the flora, since many

[1] Hann, J. Handbuch der Klimatologie, iii. ed. 3. Stuttgart (1911).

[2] Koeppe, C. E. The Canadian Climate. Bloomington, Ill. (1931).

[3] The charts comprising FIGS. 2–7 are traced from manuscript charts recently prepared by Prof. C. F. Brooks, Mr. A. J. Connor, and Dr. W. Köppen. They are very kindly made available at the Blue Hill Observatory of Harvard University before their ultimate publication in Köppen, W. and Geiger, R. Handbuch der Klimatologie, ii, Part J, Klimakunde von Nordamerika by R. DeC. Ward, C. F. Brooks, and A. J. Connor, publ. by Gebr. Borntraeger, Berlin, Germany. The charts were made on Goode's Base Map no. 202 (North America on Lambert's Azimuthal Projection). Used by permission of The University of Chicago Press.

It is pleasure to acknowledge here my indebtedness to Professor Brooks, not only for providing aid in locating climatic data, but also for his constructive suggestions.

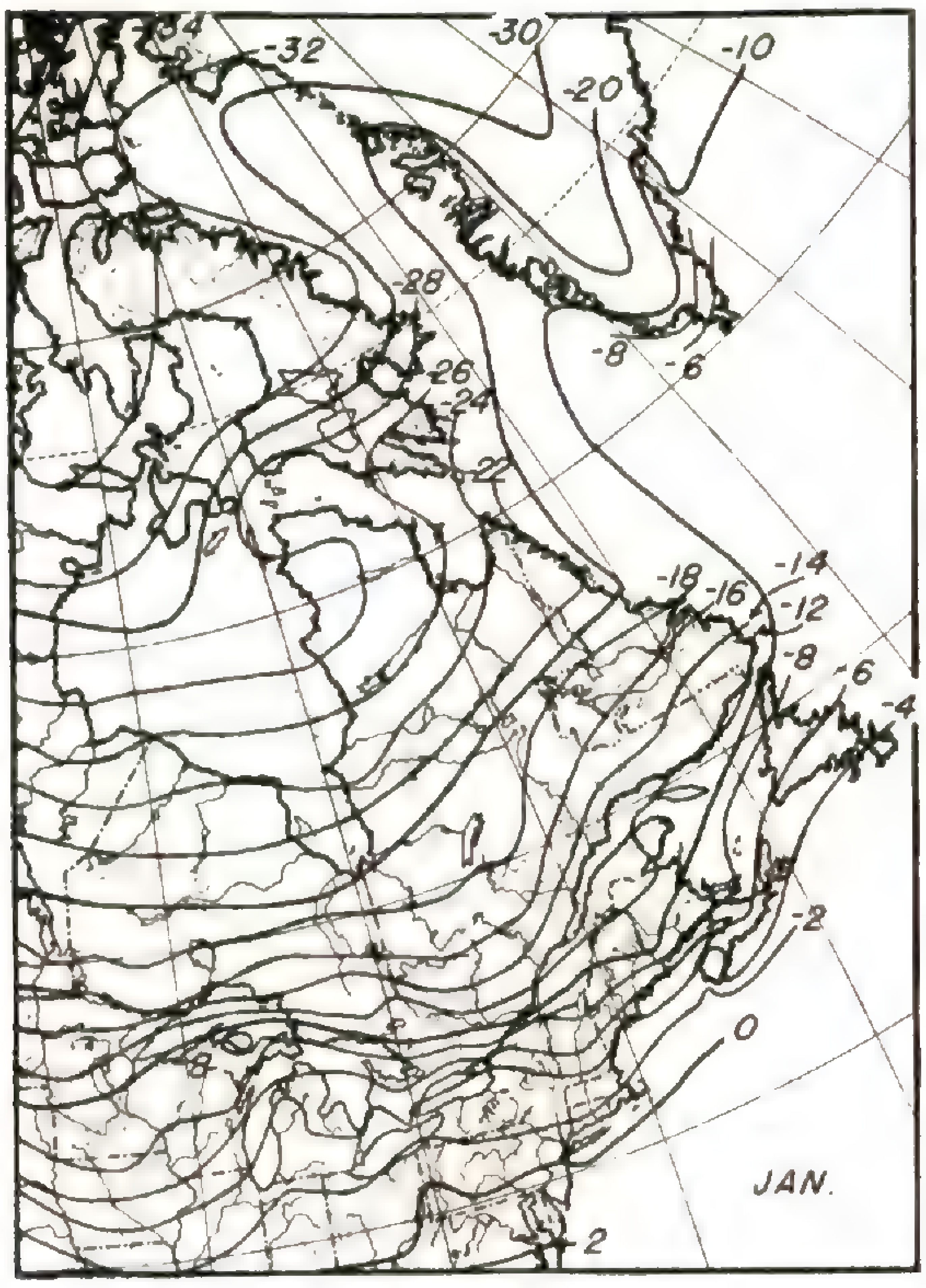


fig. 2.

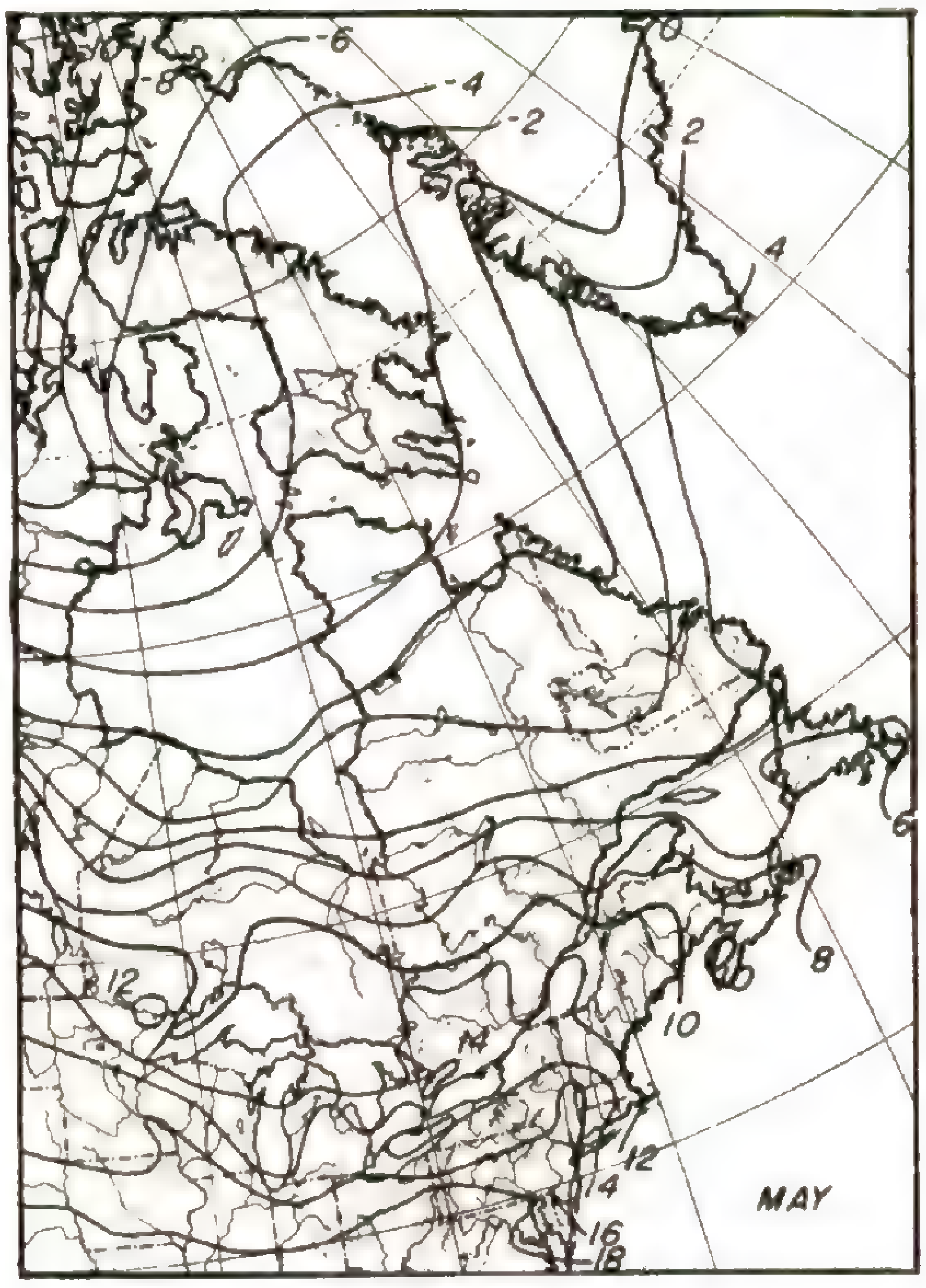


fig. 3.

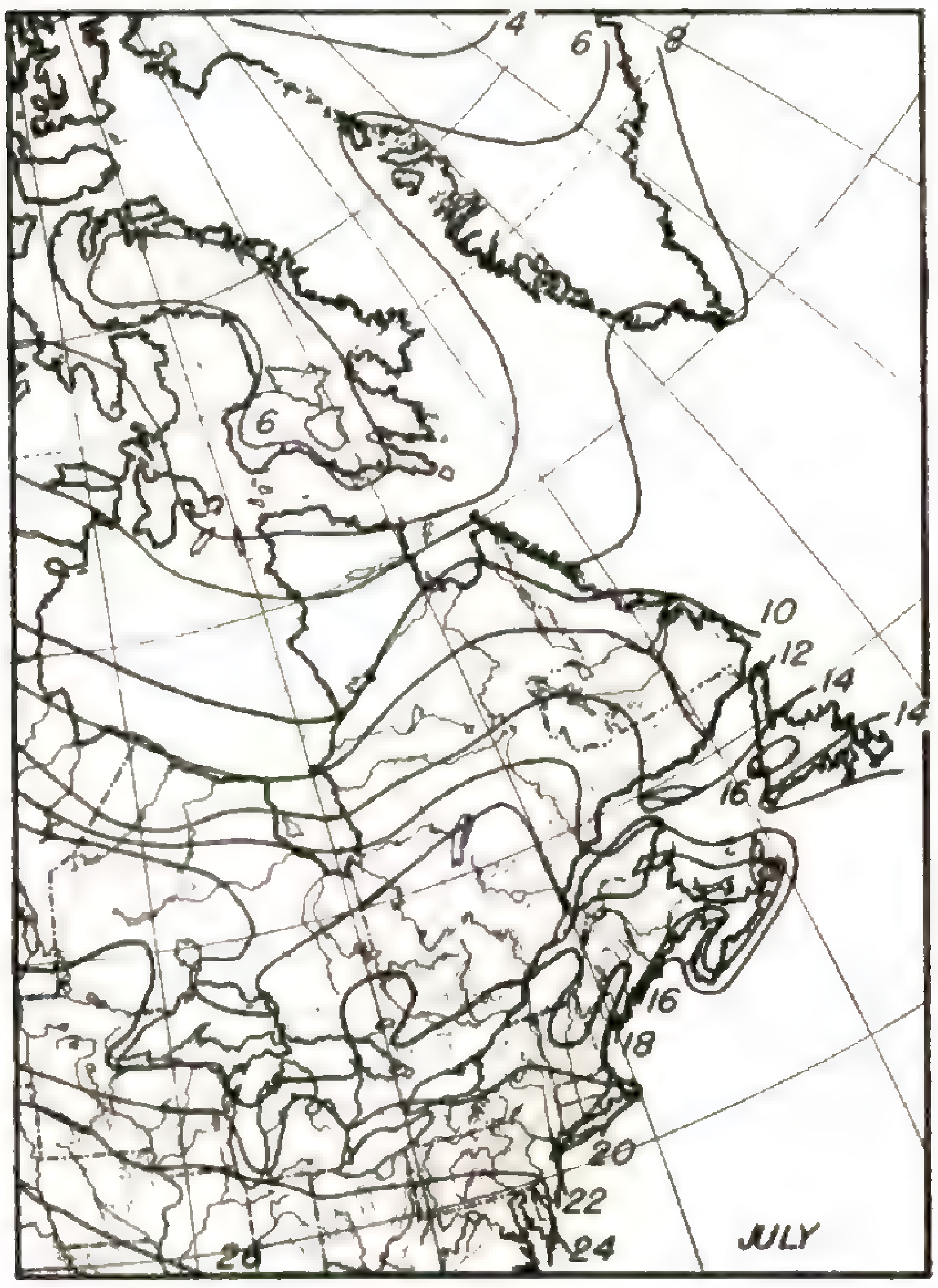


fig. 4.

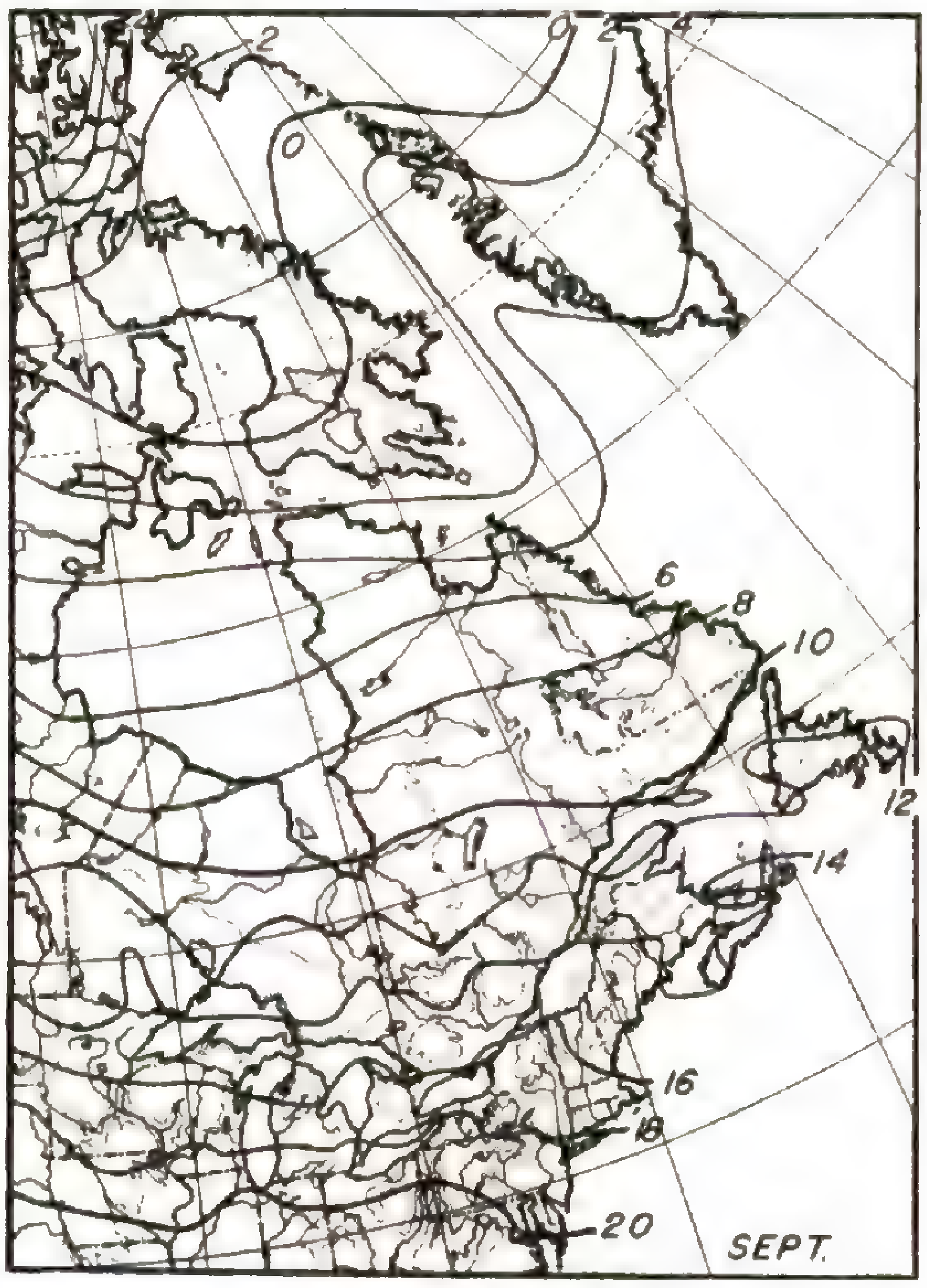


fig. 5.

SEA LEVEL ISOTHERMS IN °C.

For Sources see Footnote, p. 127.

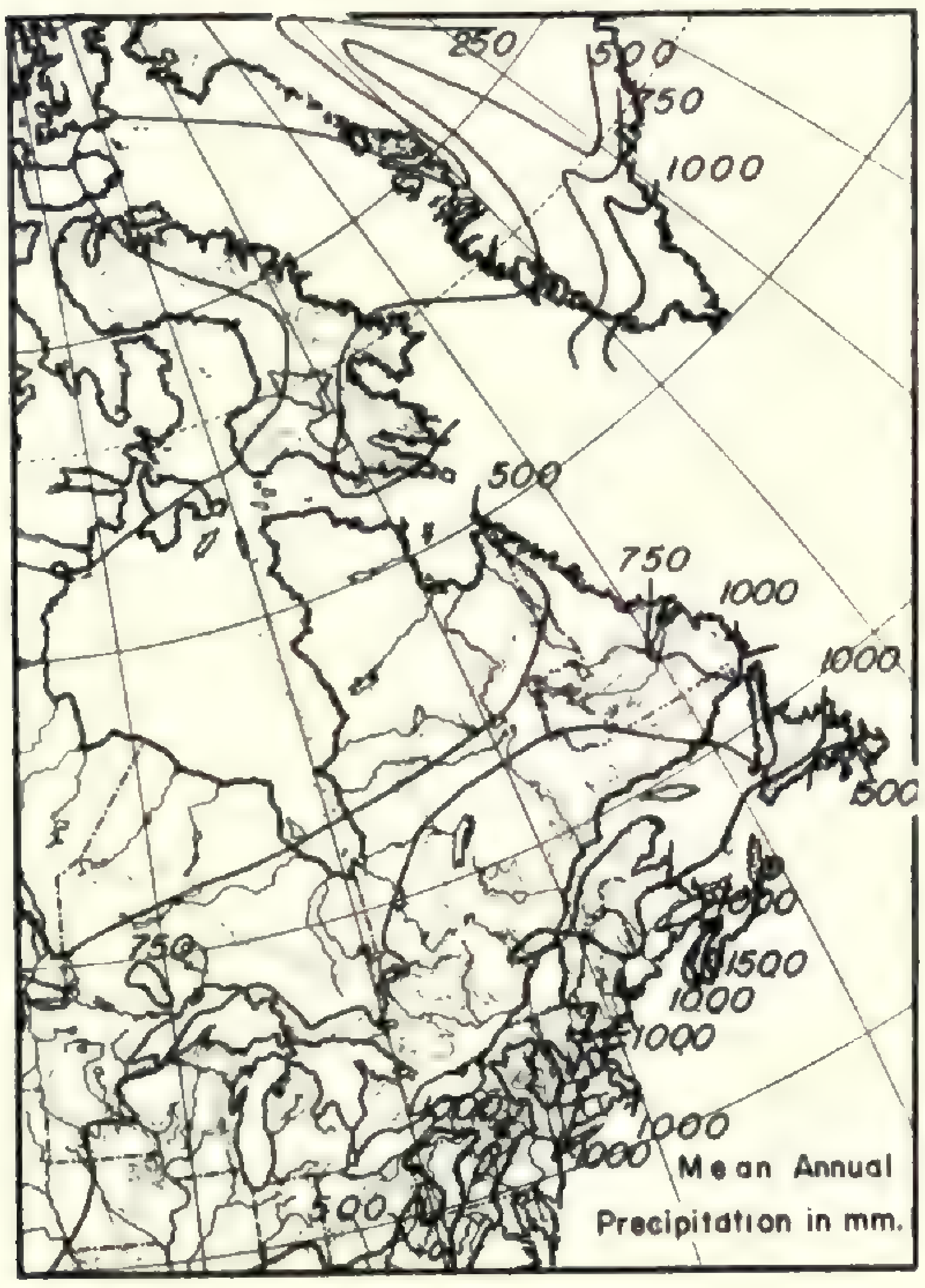


fig. 6.

fig.7.

For Sources see Footnote, p. 127.

species have a wide tolerance for temperature extremes. This is shown, for instance, in maps illustrating the distribution of *Saxifraga oppositifolia*,[1] *Androsace septentrionalis*,[2] and *Scirpus cespitosus* var. *callosus*.[3] The ranges of these species cross the isotherms in a way which indicates that certainly not all boreal species are controlled by temperature conditions alone in their distribution.

Another factor to be considered is the precipitation. In FIG. 6 the mean annual precipitation in millimeters is shown. Here again will be noted a general similarity between northern Labrador, southeastern Greenland and James Bay. FIG. 7 shows the amount of rainfall at the height of the growing season, in July. The amount of precipitation is comparable with that of southern Greenland, eastern Baffinland, the Gulf of St. Lawrence region in part, the north shore of Lake Superior, and James Bay. Like temperature, precipitation alone does not solve the problem, especially since an extra variable, the soil moisture derived from the melting snow, supplements atmospheric precipitation. On a preceding page it was pointed out that the sparse

[1] Map 1 in Fernald, M. L. Recent Discoveries in the Newfoundland Flora. Rhodora, xxxv. 7 (1933).

[2] Map 5, Fernald, l. c. 82.

[3] Map 10, Fernald, l. c. 88.

and hardy flora of the higher altitudes in northeastern Labrador could probably be attributed primarily to the small amount of available water. At lower elevations the amount of ground water becomes increasingly greater, because of the run-off from melting snow-fields and from the gradual thawing of the subsoil as the summer advances. It is, therefore, difficult to evaluate the flora in terms of atmospheric precipitation alone, especially since so many local factors operate.

Another feature responsible for the character of the climate of Labrador is the winds which are predominantly on-shore from the northerly quarter or else are from the westerly quarter.[1] Sweeping in over the ice-cold[2] Labrador current the northerly and northeasterly winds account for the low summer temperatures of Labrador, especially on the immediate coast and its islands. In combination with the low temperatures, strong on-shore winds are probably a major factor in the limitation of plant life on this immediate coastal strip because of their desiccating qualities. When the winds are offshore during the summer, weather conditions are less unfavorable, and a chinook effect has even been reported[3] which is also said to be associated with desiccation. These chinook winds were not sufficiently marked during the summer of 1931 to have been observed, although their possible occurrence had been anticipated.

To summarize the various climatic factors considered, evidently the winds off the cold Labrador current are largely responsible for the low temperature of the coastal region. Precipitation during the growing season is limited, but in favorable localities melt-water supplements it. The winds as desiccating agents are especially effective in producing conditions unfavorable for plant life. Thus plants with a sufficiently high survival value to exist at all in northeastern Labrador, really flourish only when occurring in places protected from prevailing winds and if well supplied with soil water. Thus the majority of the plants (both individuals and species) are restricted to the lower, moist, protected habitats. As pointed out above for temperature, and as is also true for the other climatic agencies, plants adapt themselves to a relatively wide range of climatic variability. Climate can be expected to become a limiting factor primarily when there is a major swing away from present conditions.

[1] Koeppe, l. c.

[2] Iselin gives the characteristic temperature of the body of the current as $-1°$ to $-1.5°$ C.; see Iselin, C. A Report on the coastal Waters of Labrador. Proc. Amer. Acad. Arts and Sci., lxvi. 21 (1930).

[3] Coleman, l. c.

While the present climate is important in its effect on the general nature of the flora, at least two other factors are probably more important in their bearing on the presence of highly localized species in Labrador. One is the influence of the underlying rocks on soil composition, and the selective effect of this on the survival of plants in favorable areas. There are indications that the basic soils are important in this respect. But this awaits not only a more general analysis of the plants collected in the past but, more especially, comprehensive collections from the Mugford region in eastern Labrador and from other as yet unexplored localities with basic rocks in western Labrador. The other factor, which may be termed the historical one, deals with glacial and post-glacial history and is of especial interest with reference to the presence of relic species which include the following: *Carex filifolia, Cerastium Beeringianum, Senecio pauciflorus, Epilobium Drummondii,* and *Arenaria humifusa.*

F. Possibilities of Survival of Relic Species on Nunataks during the Wisconsin Glaciation

In seeking a historical explanation for the occurrence of these "relic" species in northeastern Labrador several alternatives suggest themselves. First should be considered the possibility of their survival on nunataks during the height of Wisconsin glaciation. The great modern testing grounds for this concept lie in areas which today have continental glaciers, namely the Antarctic continent and Greenland. It has been pointed out on a preceding page that the most recent geological research in the Torngats throws doubt on the existence of nunataks in the high mountains of northeastern Labrador. If, however, the older theories are correct and we had nunataks as possible sanctuaries for plants during the Wisconsin glaciation they could have been either of two types. They might have been like those of the inhospitable Antarctic continent. In that case there would have been no flowering plants surviving on them, because flowering plants are unknown[1] from the explored regions of the Antarctic continent. If, on the other hand, the environmental conditions of the coast of Labrador have been like those of the coast of Greenland today, we can expect a flora to have existed on the Labrador nunataks similar to that now found on the Greenland nunataks. It is not improbable

[1] See Brown, R. N. R. Antarctic and Sub-antarctic Plant Life and some of its Problems *in* Problems of Polar Research. Amer. Geogr. Soc. Spec. Publ. no. 7 (1928).

that the latter may have been the case because of the environmental similarities between the coast of Labrador and the coast of Greenland. Even today the sparse flora of the higher mountains in northern Labrador resembles that of the nunataks of Greenland. But in both cases the plants composing this high-altitude flora are the hardy species of ubiquitous arctic occurrence. The peculiar relic forms are in general characteristically restricted to more sheltered and favorable localities. It does not appear probable that the ice-surrounded, well-drained, and wind-exposed nunataks which may have existed in northern Labrador during the Wisconsin would have been havens for plants which even today do not grow in habitats of this nature. It may be objected that abundant proof has been presented for the survival of flowering plants on nunataks and driftless areas in the Gulf of St. Lawrence region. But it is important to remember in considering this, that the solution applicable in one area is not necessarily applicable in another area different in physiography, latitude, and its geological conditions. The St. Lawrence region was far better situated during the Wisconsin for the survival of plants at higher elevations (as well as at lower levels), because of the larger areas left uncovered by ice, a warmer climate associated with its more southern latitude, and the predominance of basic rock. On the other hand, northern Labrador with its predominantly acid Archean formations, its more northern latitude and correspondingly more stringent climate, and greater (?) covering of ice was hardly as favorable for the persistence of flowering plants. This suggests another solution to the problem. Could these relic species not have survived at or near sea-level?

G. Possibilities of Survival of Relic Species near Sea Level during the Wisconsin

If these relics survived near sea-level during the Wisconsin, any major environmental change should be taken into account. Both geologists[1] and meteorologists[2] paint very similar pictures of the environment on the shores of the North Atlantic during the greatest ad-

[1] Antevs, E. Retreat of the last Ice-sheet in eastern Canada. Can. Dept. Mines, Geol. Surv. Mem. no. 146 (1925).

Bryan, K. and Cady, R. C. The Pleistocene Climate of Bermuda. Amer. Jour. Sci., xxvii. 241–264 (1934).

[2] Brooks, C. E. P. Climate through the Ages. New York (1926).

Simpson, G. C. World Climate during the Quaternary Period. Quart. Jour. Roy. Met. Soc., lx. 425 (1934).

vances of the Pleistocene continental glaciers. Very cold surface water with much floating ice from various sources, southward displacement of the Icelandic low pressure area, with corresponding northerly winds resulting in a diversion to the south of the Gulf Stream, are all points of general agreement among the authorities cited. The effects of this combination of factors on the northwestern portion of the Atlantic Basin are interesting to contemplate. Climatic conditions on the coast of northeastern Labrador would have been more severe than they are today, since the waters of the northwestern corner of the Atlantic would not have been modified even as slightly as they are today by that branch of the Gulf Stream which recurves around the southern tip of Greenland. Instead the whole area would have been subject to the temperatures of the cold surface waters. With prevailing northerly winds, ice-bergs and sea-ice would have tended to be held on shore and thus contribute to lower air-temperatures. Even today the effect of the bleak winds from over the cold Labrador current makes itself evident in the impoverished flora of the coastal islands, headlands, and exposed shore of Labrador. On the other hand, occasional southerly storm-winds of higher temperatures, both because of their origin to the south and because of the latent heat of condensation on the glacial ice-surface, might have counteracted in part effects of agencies responsible for lower temperatures, especially in less exposed localities. In addition there probably were occasional winds of the föhn type blowing off the ice-cap which would also aid in ameliorating the climate in more protected areas. Furthermore, if the coastal mountains acted as barriers to a complete inundation of the coast by ice (much as seems to be the case in Greenland today), the interaction of all these factors might well serve to provide restricted and well-protected areas with a climate sufficiently mild for plants to exist.[1] Not only lichens as suggested by Lynge,[2] but even higher plants might have grown under such conditions.[3] Another fact favoring this is that even when the air-tempera-

[1] Dr. C. Iselin of the Woods Hole Oceanographic Institute has pointed out to me that the Labrador reef may well have served to prevent extreme ice accumulation on the shores of northeastern Labrador, and also that a weak current of relatively fresh water originating from the melting of ice in and about Hudson Bay could have extended locally down the coast of Labrador. Both of these factors would have favored local amelioration of climate in northeastern Labrador.

[2] Lynge, B. General Results of recent Norwegian Research Work on Arctic Lichens. Rhodora, xxxvi. 133 (1934).

[3] A very healthy note of skepticism concerning the reconstruction of climatic conditions during past glaciations is sounded by Nannfeldt (Symbol. Bot. Ups. iii. 80 (1935)). Unfortunately, his thought-provoking paper has come to hand too late to consider in the main body of the discussion.

ture seems to be too low for metabolism in plants in the high Arctic, insolation on clear days raises the temperatures of the plants themselves to such a level that it is possible for the plants to carry on their life processes. For example, Wulff[1] found in North Greenland that on the 10th of June when the air-temperature was as low as − 4.2° C., the temperature 2 cm down in a dense, sun-exposed tuft of *Luzula confusa* was 8.0° C.; on another occasion, the 20th of June, when the air-temperature was only 5.0° C., a sun-exposed tuft of *Saxifraga oppositifolia* was 21.1° C. Possibly then, the balance of all factors were such that in areas, as at the heads of fiords, protected from wind, warmed by occasional föhn winds and by the action of direct insolation, and with melt-water available from the ice-fields above, plants may have survived through the peak of Wisconsin glaciation in the lee of the Torngat Mountains in northeastern Labrador. The major question, however, is whether the cordilleran relics mentioned above could have been among these. It is not unlikely that they could, since in North Greenland, which in many respects resembles this reconstruction of Labrador during the "Ice Age," there occur today a number of species[2] whose ranges extend thirty to forty degrees of latitude to the south, as, for instance, *Woodsia glabella* R. Br., *Festuca brachyphylla* Schultes, *Hierochloë alpina* (Lilj.) R. & S., *Eriophorum Scheuchzeri* Hoppe, *Carex incurva* Lightf., *C. glareosa* Wahlenb., *Juncus albescens* (Lange) Fern., *Oxyria digyna* (L.) Hill, *Cerastium alpinum* L., *Silene acaulis* L., var. *exscapa* (All.) DC., *Draba nivalis* Lilj., *Saxifraga oppositifolia* L , *Dryas integrifolia* Vahl, *Epilobium latifolium* L. and *Androsace septentrionalis* L. (For further examples see Fernald, l. c. pp. 120 and 121).

h. Possibilities of a Post-Wisconsin Migration of Relic Species into Northeastern Labrador during the Climatic Optimum

We have, however, to reckon with the theory that Labrador may have been covered entirely with the ice of the Wisconsin glaciation (Odell, l. c.). Under these circumstances a third alternative comes to mind, since it would have been necessary for the entire flora to have

[1] As reported by Ostenfeld, C. H. The Vegetation of the North-Coast of Greenland. Meddel. Grønl., lxiv. no. 5. 223–268 (1923).

[2] For an extensive consideration of the flora of nunatak areas in Greenland see Gelting, P. Studies on the Vascular Plants of East Greenland, etc. Meddel. Grønl., ci., No. 2. 1–337 (1934).

migrated in with the retreat of the ice. There is a growing tendency to accept the idea of rather large climatic fluctuations since the retreat of the Wisconsin ice. Evidence in favor of at least one, and possibly more, "warm periods" or "climatic optima" since the wane of the Wisconsin ice comes from a number of sources.[1] Students of molluscan and other fossil faunas find remains of southern forms far north of their present ranges;[2] meteorologists consider that there was a post-glacial climatic optimum;[3] geologists and geographers[4] on the basis of studies of variation in the levels of lakes, movements of sand dunes, temperatures of underlying rocks, deposits of tufa, studies on the salinity of inland lakes, and the analysis of clay varves are led to this same general conclusion; on the basis of the cultural history of the people of the north, archeologists[5] conclude that there have been periods of more moderate climate in post-glacial time; botanical evidence, such as the presence of remains of *Alnus fruticosa* and *Betula alba* in the post-glacial silts of the New Siberian Islands;[6] the often noted tendency for many of the higher plants in the Arctic not to mature their seeds, studies in floristics,[7] and extensive pollen-

[1] *See* Die Veränderung des Klimas seit dem Maximum der letzten Eiszeit. Eine Sammlung von Berichten . . . herausgegeben von dem Executiv Komittee des 11. Internat. Geol. Kongr. Stockholm. 1910.

[2] Brøgger, W. C. Om de senglacials og post glaciale Nivå forandringer i Kristiania-feltet (Molluskfaunen). Norges Geol. Unders. no. 31. 1–731 (1900–1901).

Praeger, R. L. Report on the Raised Beaches of the north-east of Ireland, with special Reference to their Fauna. Proc. Roy. Irish. Acad., ser. 3., iv. 30–54 (1896).

[3] Simpson, l. c. 459, 463.

Köppen, W. and Wegener, A. Die Klimate der Geologischen Vorzeit. Berlin (1924).

Brooks, C. E. P. The Evolution of Climate. London (1922).

————. Climate threough the Ages. New York (1926).

————. Some Problems of modern Meteorology, No. 16. Post-glacial Climates and the Forests of Europe. Quart. Jour. Roy. Meteor. Soc., lx. 377 (1934).

[4] Ailio, J. Die geographische Entwicklung des Ladogasees in post-glazialer Zeit. Bull. Comm. Geol. Finlande. no. 45. 1–159 (1915).

Daly, R. A. The changing World of the Ice Age. New Haven (1934).

Coleman, A. P. Ice Ages, recent and ancient. New York. 1926.

Antevs, E. Retreat of the last Ice Sheet in eastern Canada. Can. Dep. Mines, Geol. Surv. Mem. no. 146 (1925).

————. The last Glaciation. Amer. Geogr. Soc. Res. Ser. no. 17 (1928).

[5] Sollas, W. J. Ancient Hunters. ed. 3, rev. New York (1924).

Nörlund, P. Buried Norsemen at Herjolfsnes. Meddel. Grønl., lxvii. no. 1. 1–270 (1924).

Curry, J. C. Climate and Migrations. Smiths. Rep. for 1929, 423–435 (1930).

[6] Mecking, L. The Polar Regions *in* The Geography of the Polar Regions. Amer. Geogr. Soc. Spec. Publ. no. 8 (1928).

[7] Gleason, H. A. The Vegetational History of the Middle West. Ann. Ass. Amer. Geogr., xii. 39–85 (1922); see also Science, n. s., lii. 340 (1920).

Printz, H. The Vegetation of the Siberian-Mongolian Frontiers. Contr. Flor. Asiae Inter. Pert. III (publ. by Kong. Norske Vidensk Selsk. 1921).

analytical investigations in this country and in Europe[1] point to a post-glacial "warm period." Doubtless there are errors here and there in the diversified investigations mentioned above, but the mass of the evidence strongly supports the general conclusion that at least one climatic optimum has occurred between late Wisconsin time and the present. This would make a promising working hypothesis for the interpretation of the post-glacial history of the flora of northeastern Labrador, if there were definite evidence for it from northeastern Labrador itself. Unfortunately no work of any kind has come to my attention which contributes to our knowledge of post-glacial climatic fluctuations in the region (or in Arctic America generally). However, the occurrence of a climatic optimum in northeastern Labrador is strongly suggested by the evidence from many other localities in arctic and temperate zones. As a third alternative, then, it is suggested that if Labrador had been completely ice-covered in the Wisconsin the present flora of northeastern Labrador owes its character in part to migrations northward of Laurentian plants, including some of the cordilleran relics, during a possible period of post-glacial climatic amelioration.[2] With subsequent refrigeration, there may have been a restriction of these relic species to more favorable localized areas (such as those of basic rock), or even a complete destruction of some of them, in northeastern Labrador.

In summarizing the various hypotheses suggested to explain the presence of cordilleran relics in the flora of northeastern Labrador, it is evident that a great deal depends on the interpretation of the behavior of the Wisconsin ice in the region. If the majority of geologists who have visited the region are correct, we may assume the presence of nunataks, a coastwise ice-free strip of land, and ice-free coastal islands, on all of which plants could have lived through the

[1] Sears, P. B. Post glacial Climate in eastern North America. Ecology, xiii. 1–8 (1932).

————. Glacial and post glacial Vegetation. Bot. Rev. i. 37–51 (1935).

von Post, L. Problems and Working Lines in the postarctic Forest History of Europe. Proc. Fifth Int. Bot. Congress, Cambridge. 48–54 (1931).

[2] The objection might be raised that a long enough period of time has not elapsed to permit such a migration *en masse* of a flora. One has but to refer to the observations of Professor W. S. Cooper (A Third Expedition to Glacier Bay, Alaska. Ecology, xii. 61–95 (1931)) to realize that the various components of the boreal flora can follow a retreating ice-margin with amazing and sufficient celerity.

It should also be emphasized that there is floristic evidence for the infiltration of some species from Greenland and the Arctic Archipelago into Northeastern Labrador. The agency involved is doubtless wind (see Simmons, Phytogeogr. Arct. Amer. Archipel., for a consideration of the important role played by wind in the dispersal of plants in the Arctic.).

maximum of glaciation. By analogy with Greenland today, especially northern Greenland (to which northern Labrador probably approached most closely in environmental conditions during the Wisconsin), it is suggested that cordilleran relics which today are limited to lower elevations in northeastern Labrador would probably not have survived on the wind-swept, overly well-drained nunataks. Nor from our knowledge of the extreme maritime climate of coastal islands is it likely that relic species would have survived there. But they may have survived in the favorable habitats at the heads of fiords where the desiccating power of the winds would have been felt least, and with a southerly exposure so that plants could have benefited from warmth obtained by direct insolation and have had melt-water available from the ice. Since relics have persisted in North Greenland in known areas of this type, this appears to explain best the persistence of cordilleran species in northern Labrador as well. However, if it is correct that the ice extended over all the land at the height of glacial development in the Wisconsin, then we must have recourse to a post-glacial migration of all plants, rather than their persistence in place. Under these circumstances, during the climatic optimum subsequent to the retreat of the ice, there may have been an immigration into northeastern Labrador of a contingent from the relic floras of the driftless areas of the St. Lawrence region. With subsequent refrigeration leading to our present climate there would have been a localization of the relic forms to the areas where they are found today. This hypothesis does violence to the concept of relics as senescent and non-aggressive species which have largely lost their power of migration. It also depends on the idea of a post-glacial climatic optimum, for which direct evidence from northeastern Labrador is lacking, although it appears to have been satisfactorily demonstrated elsewhere in the North. Therefore it should be tested further as new data become available. In the light of our present knowledge we must give preference to the theory that these cordilleran relics survived in protected habitats of relatively low altitude at or near the places where they today occur.

In conclusion, I should like to thank Professor M. L. Fernald for his unfailing interest and stimulating suggestions in the course of this study, as well as for his aid in the determination of the specimens. To other authorities of the Gray Herbarium, especially Mr. C. A. Weatherby, I am grateful for aid in connection with various phases of

this work. It is a pleasure to acknowledge the help given by Dr. H. M. Raup of the Arnold Arboretum, both in the taxonomy of Arctic plants and in the interpretation of their distribution. To the many others who have liberally given of their time and experience, and to my wife, Mrs. Lucy B. Abbe, who has helped in so many ways, I should also like to express my thanks.

Vascular Plants Collected in Labrador on the Grenfell-Forbes Northern Labrador Expedition, 1931

In the following list, the plants collected in Labrador only are noted, while the collections made in the short time spent in Newfoundland are omitted. Several members of the expedition helped in the collecting and to save space in the enumeration of plants, their names will be designated by the following abbreviations placed in parentheses after the number of each collection: (A) Ernst C. Abbe; (B) E. B. Brooks, jr.; (F) Miss K. Forbes; (H) Mrs. M. C. D. Hogg; (N) Noel Odell; (O) Mrs. M. Odell. Mention here should also be made of Mr. Hoyt Pease, who provided very efficient aid in Newfoundland up to the time he concluded his temporary connection with the expedition to join Dr. Grenfell.

Plants new to the coast of Newfoundland Labrador, as judged by the specimens in the Gray Herbarium, are marked with an asterisk (*). The arrangement of genera and species is essentially that of Engler and Prantl. Dates are not given but may be determined for the most part from the itinerary provided in the discussion of the botanical results of the expedition. The localities under each species are arranged in order from north to south along the coast.

When a species has been collected but a few times from the coast of Labrador I have taken occasion to mention the other stations from which it is known in the region. If the first occurrence on the coast is here noted, the distribution elsewhere in eastern North America is given in most cases.

Woodsia ilvensis (L.) R. Br. Scree slope, Valley of the Bryant Lakes, Kangalaksiorvik, no. 2 (A); face of cliff on north side of Razorback Harbor, no. 3 (A); Ogualik Island, no. 4 (O); gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 1 (A); in the Rev. P. Hettasch's rock garden at the Moravian Mission, Nain, nos. 600, 601 (A).

No. 600 was introduced by the Rev. Hettasch from the surrounding country, while he brought no. 601 into his garden from Hebron.

*W. GLABELLA R. Br. Gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 5 (A).

This collection provides an intermediate station between the northern known limit of the species in Greenland and the Arctic Archipelago, and its more southern occurrence in the Gulf of St. Lawrence region. Another possible intermediate station of this kind is that for POLYSTICHUM LONCHITIS (L.) Roth. The Rev. Hettasch reports this as growing on Ogualik Island but unfortunately it must remain as his "sight record" since he did not collect a specimen of it.

CYSTOPTERIS FRAGILIS (L.) Bernh. Old scree, Valley of the Bryant Lakes, Kangalaksiorvik, no. 8 (A); moist slope on north side of Razorback Harbor, no. 9 (A); mossy spot near waterfall, north side of Nachvak, no. 10 (B); on slaty talus slope, Rowsell Harbor, no. 7 (A & O); gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 6 (A).

EQUISETUM SYLVATICUM L., var. PAUCIRAMOSUM Milde. See Fernald, RHODORA, xx. 129 (1918). Mossy spot near waterfall, Nachvak, no. 12 (B).

LYCOPODIUM SELAGO L., var. APPRESSUM Desv. For this and the following species of *Lycopodium* see Marie-Victorin, Les Lycopodinées du Quebec (1925). Ridge extending south from East Bay, Ikordlearsuk, no. 14 (A & O); west side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 15 (A); summit of "K-2," north side of Komaktorvik, no. 16 (A).

L. ALPINUM L. See Porsild, Medd. Grønl. xciii. no. 3, 3 (1935). First ridge north of Kangalaksiorvik, no. 18 (A); moist slope on the north side of Razorback Harbor, no. 19 (A).

SELAGINELLA SELAGINOIDES (L.) Link. Moist, sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 20 (A & H).

JUNIPERUS COMMUNIS L., var. MONTANA Ait. In ericaceous mat, shore of Ittekaut Bay, Kikkivitak Island, no. 22 (A).

SPARGANIUM HYPERBOREUM Laestad. Shallow pool in rocks, Rodney Mundy Island, Indian Harbor, no. 23 (A & H).

This collection is characterised by well-developed fruits of the previous year. The species has been collected previously in Labrador by *Bishop* at Cape Harrigan, and by *Sewall* at Anatolak.

TRIGLOCHIN PALUSTRE L. At stream-mouth near the Moravian Mission, Hopedale, no. 24 (A & H).

HIEROCHLOË ODORATA (L.) Wahlenb. Moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 101 (A & H).

H. ALPINA (Liljebl.) R. & S. On ridge extending south from East Bay, Ikordlearsuk, no. 107 (A & O); summit of "K-2," north side of Komaktorvik, no. 105 (A); morainal bench near the "K" River, Kangalaksiorvik, no. 104 (A); top of ridge north of Razorback Harbor,

no. 108 (A); on the main ridge of Precipice Mountain, no. 106 (A); Valley of the Twin Falls, Kaumajet Mountains, no. 103 (A); near the top of the hill back of Battle Harbor, no. 102 (A).

*Alopecurus aequalis Sob., var. natans (Wahlenb.) Fernald. See Fernald, Rhodora, xxvii. 196 (1925). In tundra pool near west shore of the island, Kikkertaksoak, Saglek, no. 100 (A).

Otherwise known in eastern North America from Greenland and the Gulf of St. Lawrence area.

*Phippsia algida (Soland.) R. Br. Near the mouth of stream emptying into East Bay, Ikordlearsuk, no. 99 (A); on moist, meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 98 (A); on a very wet spot left by a melting snow bank, lower slopes of "K-2," Komaktorvik, no. 97 (A).

Also known from Greenland, the Arctic Archipelago, Port Burwell on Ungava Bay, and Hudson Strait.

Agrostis borealis Hartm. See Fernald, Rhodora, xxxv. 203 (1933). Moist meadowy hillsides on Near Island (Amiktok), Kangalaksiorvik, no. 89 (A); scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 87 (A); north shore of Komaktorvik Lake, no. 88 (A); Ogualik Island, no. 90 (B); hilltop above large sphagnum bog, Kikkivitak Island, Ittekaut Bay, no. 91 (A); in the Salix-Empetrum mat near the old Eskimo village back of Hopedale, no. 86 (A & H); moist, mossy spot near the top of the hill back of Battle Harbor, no. 85 (A).

Calamagrostis canadensis (Michx.) Nutt., var. robusta Vasey. See Inman, Rhodora, xxiv. 142 (1922); Stebbins, Rhodora, xxxii, 42 (1930). North shore of the fiord, Kangalaksiorvik, no. 92 (F & O); mossy spot near waterfall on the north side of Nachvak, no. 93 (B).

C. neglecta (Ehrh.) Gaertn. See Stebbins, l. c. 53. Shores of Seaplane Cove, Kangalaksiorvik, no. 94 (O & H).

C. neglecta (Ehrh.) Gaertn., var. borealis (Laestad.) Kearney. See Stebbins, l. c. 55. Shores of Seaplane Cove, Kangalaksiorvik, nos. 95, 96 (O & H).

Deschampsia alpina (L.) Roem. and Schult. In mossy spot near mouth of stream emptying into the south side of East Bay, Ikordlearsuk, no. 82 (A & O); in the tundra above the anchorage, Ryans Bay, no. 81 (A & O); north shore of Kangalaksiorvik, no. 80 (F & O).

Deschampsia flexuosa (L.) Trin. North shore of Komaktorvik Lake, no. 76 (A); in the valley of the Komaktorvik River, no. 77 (A); moist, open place in a grove of spruce and fir, Kikkivitak Island, Ittekaut Bay, no. 78 (A); near stream on upper slopes of hill back of Battle Harbor, no. 79 (A).

This material has the longer spikelets (0.4 to 0.6 mm.) of the Arctic and European mountain specimens, as well as their slightly less open inflorescence and less delicate branchlets of the panicles, thus differing

from the plants of the more southern part of the range of this species in North America. This material may well be *D. flexuosa* var. *montana* (L.) Trin.

D. ATROPURPUREA (Wahlenb.) Scheele. In the tundra above the anchorage, Ryans Bay, no. 83 (A & O); in the valley of the Komaktorvik River, no. 84 (A).

TRISETUM SPICATUM (L.) Richter. For this and its varieties see Fernald, RHODORA, xviii. 195 (1916). Ogualik Island, no. 69 (B).

T. SPICATUM (L.) Richter, var. MAIDENII (Gandoger) Fernald. Near the mouth of the "K" River, Kangalaksiorvik, no. 71 (A); moist gully on south side of cliff on north side of Razorback Harbor, no. 72 (A); between beach and slaty talus slope, no. 70 (A & O); restricted moist area on the ridge leading up to the easterly summit of the Bishop's Mitre, Kaumajet Mountains, no. 73 (A).

T. SPICATUM (L.) Richter, var. PILOSIGLUME Fernald. Scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 75 (A); in Salix-Empetrum mat near the old Eskimo village back of Hopedale, no. 74 (A & H).

POA ALPINA L. On the north side of the fiord, Kangalaksiorvik, no. 42 (A); in the valley of the Komaktorvik River, no. 41 (A); near the summit of the Bishop's Mitre, Kaumajet Mountains, no. 43 (A).

P. ALPINA L., var. BREVIFOLIA Gaudin. Between the beach and the slaty, talus slope, Rowsell Harbor, no. 39 (A & O).

P. GLAUCA M. Vahl. (*cf.* J. A. Nannfeldt, Symbol. Bot. Ups. v. (1935)). At the margins of soil polygons on the second summit of Ikordlearsuk Mountain, Ikordlearsuk, no. 60 (A); west side of the Valley of the Bryant Lakes, Kangalaksiorvik, nos. 51, 52 (A); spur on the southwest side of Mount Tetragona, Kangalaksiorvik, nos. 47, 50 (A); flood-plain of the "K" River, Kangalaksiorvik, no. 46 (A); on the top of Precipice Mountain, no. 49 (A); top of ridge north of Razorback Harbor, no. 53A; scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 48 (A); in an exceptional and restricted, moist, mossy area on the dry ridge leading to the east summit of the Bishop's Mitre, no. 61 (A); on Odell's Peak west of the Bishop's Mitre, no. 54 (N); in the Valley of the Twin Falls, Kaumajet Mountains, nos. 44, 45 (A).

P. ARCTICA R. Br. (*P. rigens* of Lindman, perhaps not of Hartm. See Nannfeldt, Symb. Bot. Ups. iii. (1934)). Moist swaley place near stream in the Valley of the Bryant Lakes, Kangalaksiorvik, no. 65 (A); north shore of Kangalaksiorvik, no. 59 (F & O); on the summit of "K-2," Komaktorvik, no. 64 (A); on morainal bench near the "K" River, Kangalaksiorvik, no. 63 (A); in the valley of the Komaktorvik River, no. 58 (A); between the beach and the slaty talus slope, Rowsell Harbor, no. 56 (A & O); on the easterly summit of the Bishop's Mitre, Kaumajet Mountains, no. 66 (A).

P. ALPIGENA (Fr.) Lindm. See Lindman in Lynge, Rep. Sci. Res.

Norw. Exp. Novaya Zemlya, 1921, no. 13. 114 (1923). In the valley of the Komaktorvik River, no. 611 (A); on the scree slope from the top of Precipice Ridge to Komaktorvik Lake, no. 57 (A); between the beach and the base of the slaty talus slope, Rowsell Harbor, no. 55 (A & O); in the tundra beyond the wireless station at Battle Harbor, no. 62 (A).

Dupontia psilosantha Rupr. Upper margin of the beach on the south side of East Bay, Ikordlearsuk, no. 67 (A & O).

Puccinellia phryganodes (Trin.) Scribn. & Merr. See Fernald and Weatherby, Rhodora, xviii. 8 (1916). Near the mouth of a stream emptying into the south side of East Bay, Ikordlearsuk, no. 26 (A & O); on the shores of Seaplane Cove, Kangalaksiorvik, no. 25 (O & H).

This is known from the coast of Labrador by the previous collection made by Sornborger at Nain in 1897. It was also collected from Port Burwell on Ungava Bay in 1927 and 1928 by M. O. Malte.

Festuca rubra L. See Fernald, Rhodora, xxxv. 132 (1933). In "The Park," Hopedale, no. 38 (A, H & F).

F. brachyphylla Schultes. West side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 33 (A); on the summit of "K-2," north side of Komaktorvik, no. 30 (A); in the valley of the Komaktorvik River, no. 32 (A); on the ridge north of Razorback Harbor, nos. 34, 35, 36 (A); scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 31 (A); between the beach and the slaty talus slope, Rowsell Harbor, no. 29 (A & O); in Salix-Empetrum mat near the old Eskimo village, Hopedale, no. 28 (A & H).

Festuca brachyphylla Schultes and *Festuca supina* Schur have been thoroughly confused in the literature on arctic botany. They are, however, beautifully distinct taxonomically, *F. brachyphylla* having anthers from 0.5 to 1.2 mm. long and the leaf-sheaths split to the base, while *F. supina* has the anthers 1.8 to 3.0 mm. long and the leaf-sheaths split but two-thirds or three-quarters of the way to the base. Other characters exist as well,[1] but an examination of the material in the Gray Herbarium indicates that those mentioned are the most serviceable ones. *F. brachyphylla* was described by Robert Brown[2] in 1824 as *F. brevifolia,* but due to the earlier *F. brevifolia* Muhl., 1817, the first valid name is *F. brachyphylla* Schultes.[3] Brown in his description does not specify either the length of the anthers or the nature of the leaf-sheath, but fortunately there is a co-type of his *F. brevifolia* at the Gray Herbarium, which upon examination substantiates the characters given above.

[1] Fernald, Rhodora, xxxvii. 250 (1935).
[2] Brown, R. Chloris Melvilliana. App. Parry's Voy. Suppl. 289 (1824).
[3] Schultes, Mant. iii. 646 (1827).

Mention should be made of a persistent error. Hackel[1] characterises the sheath of *F. brachyphylla* as "omnino v. saltem a basi ultra medium usque integrae" although at the same time he gives the anther-dimensions correctly in his key. This mistake was perpetuated by Piper[2] when he described the sheaths as "closed their whole length or nearly." As recently as 1925, Saint-Yves[3] repeats the old error, although Simmons[4] had detected it in 1906.

F. VIVIPARA (L.) Sm. See Fernald, RHODORA, xxxvii. 250 (1935). Near the top of the hill back of Battle Harbor, no. 37 (A).

ELYMUS ARENARIUS L., var. VILLOSUS E. Mey. See St. John, RHODORA, xvii. 98 (1915). In "The Park," Hopedale, no. 68 (A, H & F).

ERIOPHORUM SCHEUCHZERI Hoppe. See Fernald, RHODORA, xxvii. 203 (1925). Moist area between "K-1" and "K-2," Komaktorvik, no. 113 (A); seaward side of hill back of Battle Harbor, no. 112 (A).

E. SPISSUM Fernald. North shore of Komaktorvik Lake, no. 116 (A); near the top of the hill back of Battle Harbor, no. 115 (A).

E. ANGUSTIFOLIUM Roth. See Fernald, RHODORA, vii. 88 (1905) West side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 120 (A); in a large sphagnum bog on Kikkivitak Island, Ittekaut Bay, no. 121 (A); in a sphagnous meadow beside a lake on Gready Island, no. 119 (A & H).

SCIRPUS CESPITOSUS L., var. CALLOSUS Bigelow. See Fernald, RHODORA, xxiii. 22 (1921). In the dry ericaceous mat, shore of Kikkivitak Island, Ittekaut Bay, no. 110 (A).

KOBRESIA BELLARDI (All.) Degland. See Mackenzie, N. A. Flora, xviii. 4 (1931). On the west side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 123 (A).

*CAREX CAPITATA L. In the Valley of the Komaktorvik River, no. 124 (A); in the tundra near the west shore of Kikkertaksoak Island, Saglek Bay, no. 125 (A).

The only other collection in the Gray Herbarium of this from the Labrador peninsula is that made by *Malte* at Port Harrison on the east coast of Hudson Bay.

*C. MARITIMA Gunner (*C. incurva* Lightf.). See Fernald, RHODORA, xxxv. 395 (1933). Sandy stream bank, Near Island (Amiktok), Kangalaksiorvik, no. 126 (A).

Otherwise known from Greenland, the Arctic Archipelago, Newfoundland and Hudson Bay in eastern North America.

[1] Hackel, E. Monographia Festucarum Europaearum, 82. Berlin (1882).

[2] Piper, C. V. North American Species of Festuca. Contr. U. S. Nat. Herb. x pt. 1, 27 (1906).

[3] Saint-Yves, A. Contr. a l'étude des Festuca (Subgen. Eu-Festuca) de l'Amérique du Nord et du Mexique. Candollea, ii. 257 (1925).

[4] Simmons, H. G. Vascular Plants in the Flora of Ellesmereland. Rep. Sec. Nor. Arc. Exp. "Fram" 1898–1902. no. 2, 154 (1906).

C. bipartita All. (*C. Lachenalii* Schkuhr). See Mackenzie, Bull. Torr. Bot. Club, l. 348 (1923). Scree on the south side of Peak 19, The Four Peaks, Kangalaksiorvik, no. 128 (A); on the north side of Kangalaksiorvik, no. 127 (O & F).

C. glareosa Wahl. Tundra above the anchorage at Ryans Bay, no. 129 (A & O).

C. canescens L. Stream-margin just above large sphagnum bog on Kikkivitak Island, Ittekaut Bay, no. 130 (A).

C. scirpoidea Michx. Moist, meadowy hillsides on Near Island (Amiktok), Kangalaksiorvik, no. 135 (A); summit of "K-2," north side of Komaktorvik, no. 134 (A); moist gully in cliff on the north side of Razorback Harbor, no. 136 (A); on slaty talus slope, Rowsell Harbor, no. 133 (A & O); moist, sphagnous tundra near small brook on Rodney Mundy Island, Indian Harbor, no. 132 (A & H).

Number 136 is of interest in that it has brown rather than the more usual purple scales.

C. capillaris L. On moist meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 143 (A); near the summit of "K-2," north side of Komaktorvik, no. 142 (A); on slaty talus slope, Rowsell Harbor, no. 141 (A & O); seaward side of the island, Battle Harbor, no. 140 (A).

*C. misandra R. Br. On a moist bench near the summit of the Bishop's Mitre, Kaumajet Mountains, no. 145 (A); on the lower ridge east of the Valley of the Twin Falls, no. 144 (A).

This has been collected elsewhere on the Labrador peninsula by *M. O. Malte* at Port Burwell on Ungava Bay in 1927.

C. rariflora (Wahlenb.) Smith. Moist, meadowy hillsides on Near Island (Amiktok), Kangalaksiorvik, no. 147 (A); in a large sphagnum bog on Kikkivitak Island, Ittekaut Bay, no. 148 (A); in a sphagnous meadow on Gready Island, no. 146 (A & H).

C. paupercula Michx. In a large sphagnum bog on Kikkivitak Island, Ittekaut Bay, no. 149 (A).

C. Vahlii Schkuhr (*C. alpina* Swartz). See Fernald, Rhodora, xxxv. 398 (1933). On moist, meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 150 (A); between the beach and talus, Rowsell Harbor, no. 153 (A & O).

C. concolor R. Br. (*C. rigida* Good.). In boggy meadow at the foot of the ridge south of East Bay, Ikordlearsuk, no. 160 (A & O); on ridge extending south from East Bay, Ikordlearsuk, no. 158 (A & O); moist meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 157 (A); top of the ridge north of Razorback Harbor, no. 159 (A); on the main ridge, Precipice Ridge, no. 156 (A); Ogualik Island, no. 161 (B); in the Valley of the Twin Falls, Kaumajet Mountains, no. 155 (A); moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 154 (A & H).

C. AQUATILIS Wahlenb. On the shore of a pond in the large sphagnum bog on Kikkivitak Island, Ittekaut Bay, no. 164 (A); in "The Park," Hopedale, no. 163 (A, H & F); in a sphagnous meadow beside lake on Gready Island, no. 162 (A & H).

*C. SUBSPATHACEA Wormskj. Near the mouth of a stream emptying into the south side of East Bay, Ikordlearsuk, no. 165 (A & O).

This rare little sedge is known otherwise in eastern North America from Greenland and the Gulf of St. Lawrence region.

*C. MICROGLOCHIN Wahlenb. Moist, meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 166 (A).

Formerly known primarily from Greenland and the Gulf of St. Lawrence region in eastern North America. It is characterized by Professor Fernald[1] as "one of the most famous of rarest sedges."

C. SAXATILIS L., var. RHOMALEA Fernald. See Fernald, RHODORA, iii. 50 (1901). In tundra above the anchorage, Ryan's Bay, no. 168 (A & O); in the valley of the Komaktorvik River, no. 167 (A); tundra near the west shore of the island, Kikkertaksoak, Saglek, nos. 169, 170 (A); at base of the cliff near the spruce-fir grove on Kikkivitak Island, Ittekaut Bay, no. 171 (A).

C. MEMBRANOPACTA Bailey. At the margins of the bog on the south side of East Bay, Ikordlearsuk, no. 172 (A & O).

LUZULA PARVIFLORA (Ehrh.) Desv. In "The Park," Hopedale, no. 184 (A, H & F).

L. CONFUSA Lindeb. On the margins of soil polygons on top of the first peak, Ikordlearsuk Mountain, Ikordlearsuk, no. 198 (A); margins of soil polygons on top of the second peak, Ikordlearsuk Mountain, no. 197 (A); on the ridge extending south from East Bay, Ikordlearsuk, nos. 195, 196 (A & O); shores of Seaplane Cove, Kangalaksiorvik, no. 194 (O & H); on the morainal bench above the anchorage, Kangalaksiorvik, no. 189 (A); on the summit of "K-2," north side of Komaktorvik, no. 190 (A); in the valley of the Komaktorvik River, no. 193 (A); top of ridge north of Razorback Harbor, no. 604 (A); on the main ridge, Precipice Ridge, north of Komaktorvik Lake, no. 192 (A); on top of Precipice Mountain, Torngat Mountains, no. 191 (A); on the westerly summit of the Bishop's Mitre, Kaumajet Mountains, no. 199 (A); on the easterly summit of the Bishop's Mitre, no. 200 (A); on Odell's peak west of the Bishop's Mitre, Kaumajet Mountains, no. 605 (N); on the upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 188 (A).

L. SPICATA (L.) DC. On the summit of "K-2," north side of Komaktorvik, no. 185 (A); top of the ridge north of Razorback Harbor, no. 187 (A); scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 186 (A); on the bare hilltops of Hawkes Island, no. 603 (A).

[1] Fernald, RHODORA, xxviii. 53, 54 (1926).

L. campestris (L.) DC., var. frigida Buch. See Fernald and Wiegand, Rhodora, xv. 38 (1913). In moist gully in cliff on the north side of Razorback Harbor, no. 202 (A).

Juncus trifidus L. In a mossy spot near waterfall on the north side of Nachvak, no. 174 (B); Ogualik Island, no. 175 (O).

J. filiformis L. On the bank of a stream entering sphagnum bog on Kikkivitak Island, Ittekaut Bay, no. 176 (A).

J. biglumis L. Near the mouth of a stream emptying into the south side of East Bay, Ikordlearsuk, no. 177 (A & O).

The only previous collection from the coast of Labrador is that of *Woodworth* made in 1926 on a rocky hillside, "Ekortiarsuk" Bay (= Ikordlearsuk). It was collected by *Malte* at Port Burwell in 1927 and at Wakeham Bay in 1928, and is also known on the Arctic Archipelago, in Greenland, and on the Arctic coast of North America.

J. albescens (Lange) Fernald. See Fernald, Rhodora, xxvi. 202 (1928), and Rhodora, xxxv. 236 (1933). In the valley of the Komaktorvik River, no. 179 (A); between the beach and the slaty talus slope, Rowsell Harbor, no. 178 (A & O).

J. castaneus Smith. Moist, meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 182 (A); in the valley of the Komaktorvik River, no. 181 (A); between the beach and slaty talus slopes of the south side of Rowsell Harbor, no. 180 (A & O).

Tofieldia minima (Hill) Druce (*T. palustris* Hudson). On the west side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 206 (A); gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 203 (A); in the Valley of the Twin Falls, no. 204 (A).

Smilacina trifolia (L.) Desf. Near the top of the hill back of Battle Harbor, no. 205 (A).

Habenaria dilatata (Pursh) Hook. See Ames, Orchidaceae, iv. 62 (1910). In a moist, mossy place beyond the wireless station on the hill back of Battle Harbor, no. 207 (A).

H. obtusata (Pursh) Richards., var. collecteana Fernald. See Fernald, Rhodora xxviii. 175 (1926). On the margin of a small lake in the tundra, Aillik, no. 208 (A).

Corallorrhiza trifida Chat. In a patch of bare, wet clay near the shore of Rodney Mundy Island, Indian Harbor, no. 209 (A & H).

Salix reticulata L. Between the beach and the slaty talus, Rowsell Harbor, no. 210 (A & O).

Previously collected in Labrador by Woodworth at Ryan's Bay in 1926.

S. vestita Pursh. See Fernald and St. John, Can. Dep. of Mines, Mem. 126. 44 (1922). Mossy spot near waterfall on the north side of Nachvak, no. 213 (B); on slaty talus slope, Rowsell Harbor, no. 212 (A & O); on dry hillside above the tundra near the west shore of

the island, Kikkertaksoak, Saglek, no. 214 (A); just below the easterly summit of the Bishop's Mitre, Kaumajet Mountains, no. 216 (A); Ogualik Island, no. 215 (B).

S. Uva-ursi Pursh. On the west side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 221 (A); on the main ridge of Precipice Ridge, no. 220 (A); on the upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 219 (A); in the tundra on the seaward side of the island, Battle Harbor, no. 218 (A).

S. herbacea L. West side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 225 (A); margins of soil polygons on the upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 224 (A); at the base of the hill back of the Moravian Mission, Hopedale, no. 223 (A & H); in the sides of a moist crevice near the top of a hill on Rodney Mundy Island, Indian Harbor, no. 222 (A & H).

S. anglorum Cham. For this species and its varieties see Schneider, Bot. Gaz. lxvi. 126 (1918). West side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 232 (A); on the rock ridge approaching the east summit of the Bishop's Mitre, Kaumajet Mountains, no. 233 (A); at the base of the hill back of the Moravian Mission, Hopedale, no. 227 (A & H).

S. anglorum Cham., var. kophophylla Schn. On the west side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 231 (A); in the moist sphagnum near the top of the hill back of Battle Harbor, no. 226 (A).

Number 231 is an extreme type with cordate leaves and the twigs puberulous.

*S. anglorum Cham., var. araioclada Schn. Halfway down the scree on the south side of Peak 19, The Four Peaks, Kangalaksiorvik, no. 229 (A); on the steep bank of the "K" River, no. 228 (A).

Heretofore known only from the Gaspé Peninsula and the Rocky Mountains.

S. arctophila Cockerell. On Rodney Mundy Island, Indian Harbor, no. 235 (A & H); near the top of the hill back of Battle Harbor, no. 234 (A).

S. cordifolia Pursh, var. typica Fernald. For this species and its varieties see Fernald, Rhodora, xxviii. 181 (1926); also Schneider, Bot. Gaz. lxvi. 343 (1918). On dry, gravelly slopes, Near Island (Amiktok), Kangalaksiorvik, no. 230 (A).

S. cordifolia Pursh, var. callicarpaea (Trautv.) Fernald. On slaty talus slope, Rowsell Harbor, no. 244 (A & O); at the margin of a large sphagnum bog on Kikkivitak Island, Ittekaut Bay, no. 249 (A); on hilltop near the harbor, Gready Island, no. 241 (A & H); on the seaward side of the island, Battle Harbor, no. 240 (A).

S. cordifolia Pursh, var. intonsa Fernald. Mossy spot near waterfall on the north side of Nachvak, no. 247 (B); dry hillside

above tundra near the west shore of the island, Kikkertaksoak, Saglek, no. 248 (A); in the tundra on Rodney Mundy Island, Indian Harbor, no. 243 (A & H).

S. cordifolia Pursh, var. Macounii (Rydberg) Fernald. On the west side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 246 (A); in the moist tundra near a small brook, Rodney Mundy Island, Indian Harbor, no. 242 (A & H).

S. calcicola Fernald & Wiegand. On the bank of the "K" River near "K-1," Kangalaksiorvik, no. 252 (A); on slaty talus slope, Rowsell Harbor, no. 251 (A & O); in the Valley of the Twin Falls, Kaumajet Mountains, no. 250 (A).

S. planifolia Pursh. See Schneider, Jour. Arnold Arboretum, i. 75 (1919). In the valley of the Komaktorvik River, no. 255 (A); in a gully on the peninsula at Aillik, no. 254 (A).

S. argyrocarpa Anderss. In the valley of the Komaktorvik River, no. 245 (A).

Myrica Gale L. In the tundra beyond the wireless station, Battle Harbor, no. 256 (A).

Alnus crispa (Ait.) Pursh. Mossy spot near waterfall on the north side of Nachvak, no. 257 (B).

Betula glandulosa Michx. In moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 258 (A & H).

Koenigia islandica L. Near mouth of stream on the south side of East Bay, Ikordlearsuk, no. 264 (A & O); on mossy stream-bank, Near Island (Amiktok), Kangalaksiorvik, no. 263 (A); moist gravel under overhanging rocks, Gready Island, no. 262 (A & F).

Oxyria digyna (L.) Hill. On a restricted, moist, mossy area on the western end of the ridge near the east summit of the Bishop's Mitre, Kaumajet Mountains, no. 261 (A); in the Valley of the Twin Falls, no. 259 (A); in the gully from the Valley of the Twin Falls to the lower ridge, no. 260 (A).

Polygonum viviparum L. In sphagnum on Near Island (Amiktok), Kangalaksiorvik, no. 267 (A).

Silene acaulis L., var. exscapa (All.) DC. See Fernald and St. John, Rhodora, xxiii. 119 (1921). On gravelly slope above the tundra near the anchorage, Ryan's Bay, no. 324 (A & O); within 100 m. of the top of "K-2," north side of Komaktorvik, nos. 321, 322 (A); valley of the "K" River, Kangalaksiorvik, no. 320 (A).

Lychnis furcata (Raf.) Fernald (*L. affinis* J. Vahl). See Fernald, Rhodora, xxxiv. 22 (1932). On the dry slope of the ridge south of East Bay, Ikordlearsuk, no. 318 (A & O); old scree slope on the west side of the Valley of the Bryant Lakes, no. 319 (A); near the summit of "K-2," north of Komaktorvik, no. 317 (A).

Lychnis alpina L. In moist gully in cliff on the north side of Razorback Harbor, no. 316 (A); in the Valley of the Twin Falls, Kaumajet Mountains, no. 315 (A); crack in rock on the seaward side of Gready Island, no. 313 (O).

Cerastium alpinum L. For this species and its varieties see Fernald and Wiegand, Rhodora, xxii. 169 (1920). In a moist place on a hill-top near Gready Harbor, no. 297 (A & H).

C. alpinum L., var. glanduliferum Koch. On the ridge north of Razorback Harbor, no. 302 (A); in a restricted, moist area on a rock ridge near the east summit of the Bishop's Mitre, Kaumajet Mountains, no. 303 (A).

C. alpinum L., var. lanatum (Lam.) Hegetschw. Moist, meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 301 (A); on the northeast shoulder of Precipice Mountain, no. 300 (A); between the beach and the slaty talus, Rowsell Harbor, no. 299 (A & O); on the sides of a moist crevice near the top of a hill on Rodney Mundy Island, Indian Harbor, no. 298 (A & H).

*C. Beeringianum Cham. & Schlecht. In moist gully in cliff on the north side of Razorback Harbor, no. 305 (A); in mossy tundra, north shore of Komaktorvik Lake, no. 304 (A).

C. arvense L. Ogualik Island, no. 306 (B).

C. cerastioides (L.) Britton. In gravelly stream-bed in the edge of the tundra above the anchorage, Ryan's Bay, no. 311 (A & O); on a sandy stream-bank, Near Island (Amiktok), Kangalaksiorvik, no. 310 (A); on the north shore of Kangalaksiorvik, no. 309 (O & F); on the shores of Seaplane Cove, Kangalaksiorvik, no. 307 (A); moist gully in cliff on the north side of Razorback Harbor, no. 312 (A); scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 308 (A).

Stellaria longipes Goldie. Near a little pond in the tundra above the anchorage, Ryan's Bay, no. 293 (A & O); on the shores of Seaplane Cove, Kangalaksiorvik, no. 292 (A); between the beach and talus, Rowsell Harbor, no. 291 (A & O); Ogualik Island, no. 295 (B); mossy spot near the landing, Gready Island, no. 290 (A & F); in the Salix-Empetrum complex, Gready Island, no. 289 (A & H).

S. crassifolia Ehrh. Near the Eskimo remains, shore of Seaplane Cove, Kangalaksiorvik, no. 285 (O).

S. humifusa Rottb. Margins of soil polygons, Near Island (Amiktok), Kangalaksiorvik, no. 287 (A); in moss by brook, Near Island (Amiktok), Kangalaksiorvik, no. 288 (A); shores of Seaplane Cove, Kangalaksiorvik, no. 286 (A).

Arenaria verna L., var. pubescens (Cham.. & Schl.) Fernald. See Fernald, Rhodora, xxi. 21 (1919). On scree on the south side of Peak 19, The Four Peaks, Kangalaksiorvik, no. 275 (A); between "K-2" and the "K" River, Kangalaksiorvik, no. 607 (A); near "K-2," Komaktorvik, no. 274 (A); near the easterly summit of the Bishop's Mitre, Kaumajet Mountains, no. 276 (A); in cracks in the bare rock top of hilltop near the harbor, Rodney Mundy Island, Indian Harbor, no. 268 (A & H).

A. verna L., var. pubescens (Cham. & Schl.) Fern., forma epilis Fernald. Between the beach and the slaty talus, Rowsell Harbor, no. 273 (A & O).

This form was collected by *Sornborger* at Rama in 1897.

A. humifusa Wahlenb. (*A. cylindrocarpa* Fern.) See Fernald, Rhodora, xvi. 43 (1914) and Rhodora, xxxv. 11 and 265 (1933); also Nordhagen, Bergens Museums Årbok, 1935, Natur. rekke, No. 1 (1935). On slaty talus slope, Rowsell Harbor, no. 284 (A & O).

A. groenlandica (Retz.) Spreng. See Fernald, Rhodora, xxi. 17 (1919). Moist, gravelly areas among rocks, Kikkivitak Island, Ittekaut Bay, no. 272 (A); in cracks in the rock top of hill back of the Moravian Mission, Hopedale, no. 271 (A & H).

A. sajanensis Willd. See Fernald, Rhodora, xxi. 12 (1919). Moist, mossy slope of the ridge south of East Bay, Ikordlearsuk, no. 281 (A & O); dry, gravelly patch of soil in tundra above the anchorage, Ryan's Bay, no. 277 (A & O); shores of Seaplane Cove, Kangalaksiorvik, no. 280 (A); top of ridge north of Razorback Harbor, no. 282 (A); on the margins of soil polygons, upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 278 (A); easterly slope of the Bishop's Mitre, no. 283 (A); lower ridge above the Valley of the Twin Falls, no. 279 (A).

Sagina nivalis Fries. At the mouth of a stream emptying into the south side of East Bay, Ikordlearsuk, no. 270 (A & O); on the margins of soil polygons, upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 269 (A).

Montia lamprosperma Cham. See Fernald and Wiegand, Rhodora, xii. 138 (1910). At a stream-mouth, Near Island (Amiktok), Kangalaksiorvik, no. 613 (A).

This was called to my attention by Dr. R. A. Laubengayer in a lot of preserved *Koenigia islandica* with which it was mixed.

Anemone parviflora Michx. On slaty, talus slope, Rowsell Harbor, no. 342 (A & O); in the Valley of the Twin Falls, Kaumajet Mountains, no. 343 (A).

Ranunculus trichophyllus Chaix, var. eradicatus (Laestad.) W. B. Drew, *fide* Drew, Rhodora, xxxviii. 33 (1936). Pool in rocks on Near Island (Amiktok), Kangalaksiorvik, no. 325 (A).

R. reptans L. See Fernald, Rhodora, xix. 135 (1917). Moist, gravelly area in the tundra near the west shore of Kikkertaksoak Island, Saglek, no. 326 (A).

R. nivalis L. See Holm, Rep. Can. Arc. Exp. 1913–18, v. pt. B, 32 (1922). On the moist, mossy slope of the ridge to the south of East Bay, Ikordlearsuk, no. 328 (A & O); steep, wet bank of the "K" River, Kangalaksiorvik, no. 327 (A).

R. pygmaeus Wahlenb. See Fernald, Rhodora, xix. 138 (1917). On the ridge extending south from East Bay, Ikordlearsuk, no. 335 (A & O); mossy stream-bank, edge of the tundra above the anchorage, Ryan's Bay, no. 334 (A & O); spur on the southwest side of Mount Tetragona, no. 333 (A); valley of the "K" River, Kangalaksiorvik, no. 332 (A); on slaty talus slope, Rowsell Harbor, no. 331 (A & O);

on a restricted moist, mossy area on ridge near the east summit of the Bishop's Mitre, Kaumajet Mountains, no. 336 (A).

R. ALLENII Robinson. In the Valley of the Twin Falls, Kaumajet Mountains, nos. 329, 330 (A).

*R. PEDATIFIDUS J. E. Smith, var. LEIOCARPUS (Trautv.) Fernald (*R. affinis* R. Br.). See Fernald, RHODORA, xix. 138 (1917); and idem, xxxvi. 93 (1934). Mossy shore of lake south of East Bay, Ikordlearsuk, no. 338 (A & O); in the Valley of the Twin Falls, Kaumajet Mountains, no. 337 (A).

Otherwise known in eastern North America from Greenland, the Arctic Archipelago, Ungava, Newfoundland and the Gaspé Peninsula.

PAPAVER RADICATUM Rottb. See Hultén, Kungl. Svensk. Vetensk. Akad. Handl., ser. 3, v. no. 2, 138 (1928); also Simmons, Rep. Sec. Norw. Arc. Exp. "Fram" 1898–1902, pt. 2, 99 (1906). On the margins of soil polygons on the top of Ikordlearsuk Mountain, no. 349 (A); near "K-2," north side of Komaktorvik, no. 348 (A); on the west summit of the Bishop's Mitre, Kaumajet Mountains, no. 350 (A); lower ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 347 (A); on the slopes of the upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 346 (A); on the edge of soil polygon, on the upper ridge above the Valley of the Twin Falls, no. 345 (A).

Number 347 from the Kaumajet region was white-petalled. It was the only plant noted during the summer that had this character, but it is of interest in view of Gelting's[1] observations on the white-petalled form in Greenland that my specimen also lost its petals with even greater ease than do the yellow-petalled ones.

Whether the white-petalled form observed in northeastern Labrador is identical with that discussed by Nannfeldt (Symbol. Bot. Upsal. v. 84. (1935)) it is difficult to say. It is so rare as compared with the Scandinavian occurrence, as he reports it for some localities, that on a genetical basis the Labrador plant would seem to be a case of a sporadic, recessive mutation, rather than due to the segregation of individuals out of a population carrying factors for both white and yellow. This is evidently a case which requires cyto-taxonomic and breeding analysis for an approach to a clarification of the basic phenomena involved.

COCHLEARIA GROENLANDICA L. Between the beach and the slaty talus on the south side of Rowsell Harbor, no. 352 (A & O); moist crevice in rocky hilltop near the harbor, Gready Island, no. 351 (A & H).

[1] Gelting, Meddel. Grønl. ci. no. 2, 87 (1934).

Cardamine bellidifolia L. On the margins of soil polygons on the first peak of Ikordlearsuk Mountain, no. 359 (A); on moist, mossy north face of the ridge south of East Bay, Ikordlearsuk, no. 358 (A & O); scree on the south side of Peak 19, The Four Peaks, Kangalaksiorvik, no. 357 (A); on the lower slopes of "K-2," north side of Komaktorvik, no. 355 (A); on the steep, moist bank of the "K" River, Kangalaksiorvik, no. 354 (A); top of the ridge north of Razorback Harbor, no. 360 (A); on top of Precipice Mountain, north of Komaktorvik Lake, no. 356 (A); on the easterly peak of the Bishop's Mitre, Kaumajet Mountains, no. 361 (A); on top of the westerly peak of the Bishop's Mitre, no. 362 (A); on the margins of soil polygons, upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 353 (A).

Much of the material of this species collected in Labrador in the past has been labelled *C. bellidifolia* L., var. *laxa* Lange (see Meddel. Grønl. iii. 251 (1887)). While most of the specimens collected in the past agree well with the description of the variety in their generally loose habit, less compacted inflorescences, and longer petioles, my material provides various intermediate stages to the typical species, especially the plants from the higher exposed situations. With a graded series dependent primarily on local environmental variations, it does not seem that the variety is worthy of more than the designation of a form.

Draba fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball, *fide* M. L. Fernald. See Fernald, Rhodora, xxxvi. 286 (1934). Moist, mossy northern face of the ridge south of East Bay, Ikordlearsuk, no. 382 (A & O); steep, wet, cold bank of the "K" River, Kangalaksiorvik, no. 375 (A); spur on the southwest side of Mount Tetragona, no. 379 (A); on the lower slopes of "K-2," north side of Komaktorvik, no. 376 (A); top of the ridge north of Razorback Harbor, no. 384 (A); scree slide from the top of Precipice Ridge to Komaktorvik Lake, nos. 380, 381 (A); on slaty talus slope, Rowsell Harbor, no. 373 (A & O); on the west summit of the Bishop's Mitre, Kaumajet Mountains, no. 387 (A); on the eastward side of the east summit of the Bishop's Mitre, no. 386 (A).

D. rupestris R. Br., *fide* M. L. Fernald. See Fernald l. c. 292. Eastward side of the east summit of the Bishop's Mitre, no. 385 (A).

D. crassifolia Graham, *fide* M. L. Fernald. See Fernald l. c. 293. Steep, wet, cold bank of the "K" River, Kangalaksiorvik, no. 374 (A).

D. nivalis Liljebl., *fide* M. L. Fernald. See Fernald l. c. 296. Talus slope on the west side of the Valley of the Bryant Lakes, Kangalaksiorvik, no. 383 (A); spur on the southwest side of Mount Tetragona, nos. 377, 378 (A); margin of soil polygons on upper ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 372

(A); moist crevice near the top of hill on Rodney Mundy Island, Indian Harbor, no. 369 (A & H).

D. INCANA L., var. CONFUSA (Ehrh.) Liljebl., *fide* M. L. Fernald. See Fernald l. c. 315. At the edge of "The Park," Hopedale, no. 370 (A, H & F).

D. GLABELLA Pursh, *fide* M. L. Fernald. See Fernald l. c. 333. In the Valley of the Twin Falls, Kaumajet Mountains, no. 371 (A).

*ARABIS ARENICOLA (Richards.) Gelert. See Gelert, Bot. Tids., xxi. 287 (1898). Spur on the southwest side of Mount Tetragona, no. 390 (A); lower slopes of "K-2," north side of Komaktorvik, no. 389 (A); easterly slopes of the Bishop's Mitre, no. 391 (A); gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 388 (A).

Otherwise known from Greenland, the Arctic Archipelago, and various stations on Hudson Bay.

A. ALPINA L. In gully from the lower ridge to the Valley of the Twin Falls, no. 393 (A).

SAXIFRAGA RIVULARIS L. On moist, mossy slope of ridge south of East Bay, Ikordlearsuk, no. 400 (A & O); on the bank of the "K" River, Kangalaksiorvik, no. 397 (A); on top of Precipice Mountain, no. 398 (A); restricted moist, mossy area near the east summit of the Bishop's Mitre, Kaumajet Mountains, no. 399 (A); on the west summit of the Bishop's Mitre, no. 402 (A); lower ridge above the Valley of the Twin Falls, no. 396 (A); in a moist crevice near hilltop, Rodney Mundy Island, Indian Harbor, no. 395 (A & H); moist gravelly spot under a ledge near the harbor, Gready Island, no. 394 (A & F).

S. CERNUA L. See Fernald and Weatherby, RHODORA, xxxiii. 235 (1931). Halfway down the scree on the south side of Peak 19, The Four Peaks, no. 405 (A); on slaty talus slope, Rowsell Harbor, no. 404 (A & O); slope east of the summits of the Bishop's Mitre, Kaumajet Mountains, no. 406 (A); west summit of the Bishop's Mitre, no. 407 (A); gully from the lower ridge to the Valley of the Twin Falls, nos. 403, 426 (A).

S. CESPITOSA L. On the ridge south of East Bay, Ikordlearsuk, no. 413 (A & O); spur on the southwest side of Mount Tetragona, no. 412 (A); on slaty talus slope, Rowsell Harbor, no. 411 (A & O); ridge east of the summits of the Bishop's Mitre, no. 414 (A); gully from the lower ridge to the Valley of the Twin Falls, no. 410 (A).

S. STELLARIS L. Gravelly brook-bottom near the edge of the tundra above the anchorage, Ryan's Bay, no. 415 (A & O).

S. STELLARIS L., var. COMOSA Poir. Moist, mossy slope at the north end of the ridge extending south from East Bay, Ikordlearsuk, no. 416 (A & O).

S. NIVALIS L. Moist, mossy slope on the north end of the ridge extending south from East Bay, Ikordlearsuk, no. 420 (A & O); scree on the south side of Peak 19, The Four Peaks, no. 419 (A); spur on

the southwest side of Mount Tetragona, no. 418 (A); upper part of slaty talus slope, Rowsell Harbor, no. 417 (A & O).

S. aizoides L. Moist gully in cliff on the north side of Razorback Harbor, no. 422 (A); mossy spot near waterfall, north side of Nachvak, no. 421 (B).

S. tricuspidata Retz. Moist gully in cliff on the north side of Razorback Harbor, no. 424 (A); upper part of the slaty talus slope, Rowsell Harbor, no. 423 (A & O).

S. Aizoön Jacq. Moist slope by stream entering the north side of Razorback Harbor, no. 428 (A); mossy spot near waterfall north side of Nachvak, no. 429 (B); upper part of slaty talus slope, Rowsell Harbor, no. 427 (A & O).

S. oppositifolia L. On the upper slopes of "K-2," north side of Komaktorvik, no. 432 (A); east slope near the summits of the Bishop's Mitre, Kaumajet Mountains, no. 433 (A); gully from the lower ridge to the Valley of the Twin Falls, no. 430 (A).

S. oppositifolia L., var. albiflora Lange. See Pflanzenreich iv. Fam. 117, Heft. 69, 624. In gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 431 (A).

Parnassia Kotzebuei Cham. & Schlecht. On slaty talus slope, Rowsell Harbor, no. 437 (A & O); in gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 435 (A); in the Valley of the Twin Falls, no. 436 (A).

Rubus acaulis Michx. At base of the hill back of the Moravian Mission, Hopedale, no. 455 (A & H).

R. Chamaemorus L.

Noted farthest north along the coast of Labrador at Kikkertaksoak Island, Saglek, August 19. No fruit had set on any of the plants, the single floral pedicels ending instead in the dried remains of the flowers. Delabarre[1] also noted that during the season of 1900 the "bakeapple" had not set fruit where it occurred farthest north on the coast. Holm[2] remarks that *R. Chamaemorus* "seldom becomes sufficiently advanced to produce mature fruit in these [the Polar] regions," although he considers the center of distribution is to be sought there. Why instead is this not a plant which is either working farther north by its highly specialized and efficient means of vegetative reproduction, or else originally was farther north during the "climatic optimum" after the Wisconsin glaciation and is now surviving thanks to its capable vegetative system? Either interpretation would account for the presence of the plant in regions which environmentally are apparently not suited to its reproducing by means of fruit.

[1] Delabarre, Bull. Geogr. Soc. Phila. iii. (1902).

[2] Holm, Rep. Can. Arctic Exp. 1913–18, v. pt. B, 107 (1922).

Potentilla nivea L. In the gully from the lower ridge to the Valley of the Twin Falls, Kaumajet Mountains, no. 440 (A).

P. norvegica L., var. labradorica (Lehm.) Fern. See Fernald, Rhodora, xxviii. 213 (1926). At the edge of "The Park," Hopedale, no. 441 (A, H & F).

*P. emarginata Pursh. See Malte, Rhodora, xxxvi. 173 (1934). Moist, mossy mountain slope on the south side of East Bay, Ikordlearsuk, no. 444 (A & O); bank of "K" River, Kangalaksiorvik, nos. 442, 443 (A).

Otherwise this species is known from Port Burwell, Ungava Bay (*Malte*, 1928, and *Macoun*, 1910), Hudson Bay, Greenland, the Arctic Archipelago and elsewhere in the Arctic, and on the Shickshock Mts. of Gaspé.

P. alpestris Hall f. In mossy meadow beside lake south of East Bay, Ikordlearsuk, no. 449 (A & O); in tundra above the anchorage, Ryan's Bay, no. 450 (A & O); on the banks of "K" River, Kangalaksiorvik, no. 447 (A); near the base of "K-2," north of Komaktorvik, no. 448 (A); on the shore east of the Bishop's Mitre, no. 451 (A); in the Valley of the Twin Falls, no. 446 (A); moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 445 (A & H).

Dryas integrifolia M. Vahl. Ogualik Island, no. 454 (B); on the lower ridge above the Valley of the Twin Falls, no. 453 (A); on disintegrated trap dike near the harbor, Rodney Mundy Island, Indian Harbor, no. 452 (A & H).

Astragalus alpinus L. On upper margin of the beach, Rowsell Harbor, no. 457 (A & O); in the Valley of the Twin Falls, no. 456 (A).

A. eucosmus Robinson. In the Valley of the Twin Falls, Kaumajet Mountains, no. 459 (A); near the harbor, on Rodney Mundy Island, Indian Harbor, no. 458 (A & H).

Otherwise known from the coast at Rama where it was collected by *Stecker* in 1899 and at Nain where it was collected by *Sewall* in 1927.

*Oxytropis foliolosa Hook. For this and the following species see Fernald, Rhodora, xxx. 137 (1928). On the upper margin of the beach, Rowsell Harbor, no. 460 (A & O).

This has been collected elsewhere in eastern North America at Wakeham Bay, Hudson Strait, by *Malte* in 1927 and in Newfoundland by Professor *Fernald* and his companions. In Newfoundland Professor Fernald[1] notes that it is known only from areas with basic rock. The Labrador station is also basic rock, the Rama formation of slates. The species is otherwise known only from the Rocky Mountains.

O. terrae-novae Fernald. On the upper margin of the beach,

[1] Rhodora, xxxv. 274 (1933).

Rowsell Harbor, no. 463 (A & O); on hilltops near the harbor, Rodney Mundy Island, Indian Harbor, no. 462 (A & H); seaward side of hill back of Battle Harbor, no. 461 (A).

Lathyrus japonicus Willd., var. aleuticus (Greene) Fernald. See Fernald, Rhodora, xxxiv. 177 (1932). In cracks of the rock, top of hill near harbor, Rodney Mundy Island, Indian Harbor, no. 465 (A & H); hillsides near harbor, Gready Island, no. 464 (A & H).

Empetrum nigrum L. Tundra near the west shore of the island, Kikkertaksoak, Saglek, no. 466 (A).

Ubiquitous at lower elevations in the tundra.

Viola palustris L. Half way up hill back of the Moravian Mission, Hopedale, no. 467 (A & H).

V. pallens (Banks) Brainerd. In sphagnous meadow beside lake on Gready Island, no. 468 (A & H).

V. labradorica Schrank. In the valley of the Komaktorvik River, no. 471 (A); in the Valley of the Twin Falls, no. 470 (A); moist, sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 469 (A & H).

Epilobium angustifolium L., var. intermedium (Wormsk.) Fernald. See Fernald, Rhodora, xx. 1 (1918). Moist slope by stream on the north side of Razorback Harbor, no 478 (A).

E. latifolium L. Tundra above the anchorage, Ryan's Bay, no. 479 (A & O).

Very common in northern Labrador and especially well-developed in number of individuals and luxuriance of growth on gravelly outwash plains and deltas.

E. alpinum L. See Fernald, Rhodora, xx. 36 (1918). On the north shore of Kangalaksiorvik, no. 480 (O & F).

Conioselinum chinense (L.) B. S. P. See Fernald, Rhodora, xxviii. 221 (1926). Mossy stream bank near the top of the hill back of Battle Harbor, nos. 481, 609 (A).

Collected previously by Bishop at Frenchman's Run, 1928.

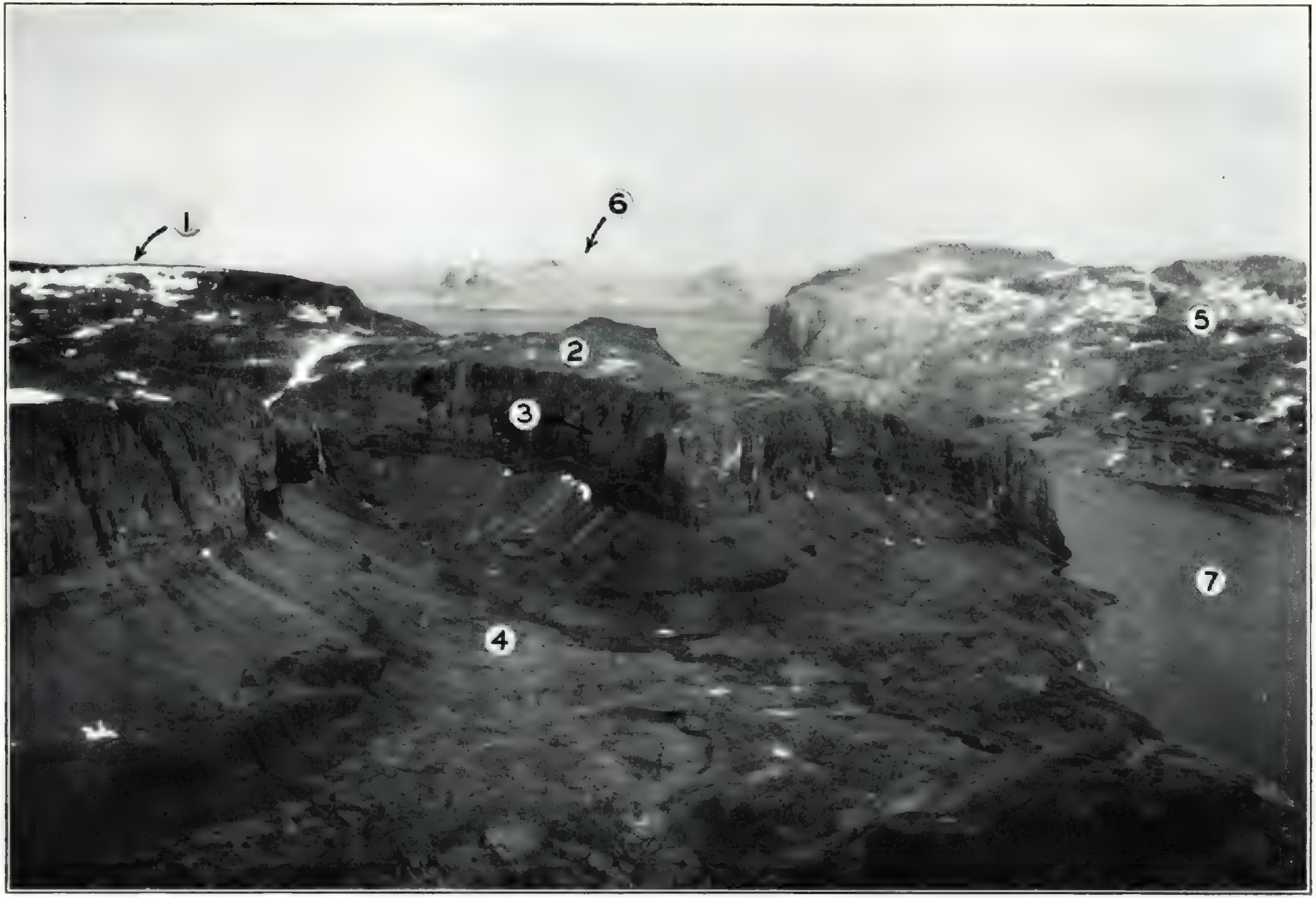
Pyrola secunda L., var. obtusata Turcz. In the Valley of the Twin Falls, Kaumajet Mountains, no. 482 (A).

P. grandiflora Radius. On slaty talus slope, Rowsell Harbor, no. 485 (A & O); in the Valley of the Twin Falls, no. 484 (A); in moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 483 (A & H).

Ledum palustre L., var. decumbens Aiton. Sphagnous meadow, Gready Island, no. 487 (A & F); tundra on Hawkes Island, no. 486 (A).

As Simmons[1] points out, the variety grades into the species proper. It hardly seems that this variety is worth more than the designation of a form, since it seems to be primarily an ecological development.

[1] Simmons, Phytogeogr. Arctic Amer. Arch. 116 (1913).



Aerial View of Valley of the Twin Falls, Kaumajet Mountains, from the Southwest, 1932 (*courtesy of* Professor Alexander Forbes). Fig. 1, the Upper Ridge above the Valley; fig. 2, the Lower Ridge; fig. 3, Gully from the Lower Ridge to the Valley; fig. 4, the Valley of the Twin Falls; fig. 5, Ogualik Island; fig. 6, Nannuktok Island; fig. 7, Mugford Tickle.

Rhododendron lapponicum (L.) Wahlenb. In the valley of the Komaktorvik River, no. 488 (A).

Cassiope tetragona (L.) D. Don. On the summit of "K-2," north side of Komaktorvik, no. 494 (A); on slaty talus slope, Rowsell Harbor, no. 493 (A & O).

C. hypnoides (L.) D. Don. West side of the Valley of the Bryant Lakes, no. 492 (A); on the summit of "K-2," north side of Komaktorvik, no. 491 (A); on the bank of the "K" River, no. 490 (A); lower ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 489 (A).

Vaccinium Vitis-Idaea L., var. minus Lodd. On the summit of "K-2," north side of Komaktorvik, no. 496 (A); on the main ridge above the Valley of the Twin Falls, no. 495 (A).

Statice labradorica (Wallr.) Hubbard & Blake. See Blake, Rhodora, xix. 1 (1917). In the Valley of the Twin Falls, Kaumajet Mountains, no. 498 (A); moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 497 (A & H).

Primula stricta Hornem. For this and the following species see Fernald, Rhodora, xxx. 59 (1928). Moist, gravelly slopes, Near Island (Amiktok), Kangalaksiorvik, no. 501 (A).

P. laurentiana Fernald. Moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 500 (A & H).

P. egaliksensis Wormskj. Cracks in rock hilltops near the harbor, Rodney Mundy Island, Indian Harbor, no. 503 (A & H).

Gentiana nivalis L. In the Valley of the Komaktorvik River, no. 504 (A); moist slope on the north side of Razorback Harbor, no. 505 (A). Also noted on the moist, cold bank of the "K" River but not collected.

A species collected but seldom on the coast of Labrador. Other collections in the Gray Herbarium from this region were made by Delabarre at Saglek Bay in 1900, by Sornborger at Rama in 1897, and by Rev. Heldenburg "in Labradoria" about 1845.

Veronica Wormskjoldii Roem. & Schult. (*V. alpina* L., var. *unalaschensis* C. & S.). See Pennell, Rhodora, xxiii. 15 (1921). Between the beach and the slaty talus, Rowsell Harbor, no. 507 (A & O); in the Valley of the Twin Falls, Kaumajet Mountains, no. 508 (A); moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 506 (A & H).

Castilleja pallida (L.) Spreng., var. septentrionalis (Lindl.) Gray. Tundra above the anchorage, Ryan's Bay, no. 610 (A & O); east shore below the Bishop's Mitre, Kaumajet Mountains, no. 512 (A); Ogualik Island, no. 511 (B); in the Valley of the Twin Falls, no. 510 (A); moist, sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 509 (A & H).

Euphrasia arctica Lange. See Fernald and Wiegand, Rhodora, xvii. 192 (1915); and also Fernald, Rhodora, xxxv. 301 (1933). Dry,

gravelly slopes, Near Island, (Amiktok), Kangalaksiorvik, no. 515 (A); wet bank of stream tributary to the "K" River, Kangalaksiorvik, no. 514 (A); between the beach and the slaty talus, Rowsell Harbor, no. 513 (A & O).

*E. HUDSONIANA Fern. and Wieg. See Fernald and Wiegand, l. c. 194. Mossy spot near waterfall on the north side of Ryan's Bay, no. 516 (B).

This little-known species was collected by *Spreadborough* on the Koaksoak River, Ungava Bay, in 1896. Otherwise it seems to be unknown from the Labrador peninsula and previously had not been collected from the Atlantic coast.

BARTSIA ALPINA L. Between the beach and the slaty talus, Rowsell Harbor, no. 519 (A & O); in the Valley of the Twin Falls, Kaumajet Mountains, no. 518 (A); moist, sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 517 (A & H).

PEDICULARIS LAPPONICA L. On slaty talus slope, Rowsell Harbor, no. 520 (A & O); in the Valley of the Twin Falls, Kaumajet Mountains, no. 612 (A).

P. LABRADORICA Hout. See Fernald, RHODORA, xxxiii. 193 (1931). Near the beach by the old Eskimo village, Hopedale, no. 521 (A & H).

P. FLAMMEA L. On slaty talus slope, Rowsell Harbor, no. 523 (A & O); in the Valley of the Twin Falls, Kaumajet Mountains, no. 522 (A).

PINGUICULA VILLOSA L. Moist, sphagnous tundra near a small brook, Rodney Mundy Island, Indian Harbor, no. 525 (A & H).

P. VULGARIS L. Mossy spot near waterfall on the north side of Nachvak, no. 524 (B).

PLANTAGO JUNCOIDES Lam., var. GLAUCA (Hornem.) Fernald. See Fernald, RHODORA, xxvii. 93 (1925). Freshwater pool near harbor, Gready Island, no. 527 (A & H).

LONICERA VILLOSA (Michx.) R. & S., var. CALVESCENS (Fern. & Wieg.) Fernald. (*L. caerulea* L., var. *calvescens* Fern. & Wieg.). See Fernald, RHODORA, xxvii. 8 (1925). In moist, sphagnous tundra near small brook, Rodney Mundy Island, Indian Harbor, no. 528 (A & H).

LINNAEA BOREALIS L., var. AMERICANA (Forbes) Rehder. Margin of spruce-fir grove, Kikkivitak Island, Ittekaut Bay, no. 529 (A).

CAMPANULA UNIFLORA L. In the Valley of the Twin Falls, Kaumajet Mountains, no. 476 (A); side of a gravelly hill on Rodney Mundy Island, Indian Harbor, no. 475 (A & O).

The collection from the Valley of the Twin Falls has the corolla markedly shorter than the calyx-lobes which gives it a distinctive appearance. An examination of the material in the Gray Herbarium indicates, however, that it is merely a very extreme form connected by

intermediates with the more usual type, which also varies to the other extreme where the corolla is much longer than the calyx.

C. ROTUNDIFOLIA L. See Malte, RHODORA, xxxvi. 188 (1934). Among rocks in the delta of the "K" River, Kangalaksiorvik, no. 473 (A); top of the ridge north of Razorback Harbor, no. 474 (A); moist sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 472 (A & H).

SOLIDAGO MACROPHYLLA Pursh, var. THYRSOIDEA (E. Meyer) Fernald. See Fernald, RHODORA, viii. 227 (1906). Mossy spot near waterfall on the north side of Nachvak, no. 531 (B); between the hill and the beach near the old Eskimo village, Hopedale, no. 530 (A & H).

S. MULTIRADIATA Ait. See Fernald, RHODORA, xvii. 4 (1915). Moist gully in cliff on the north side of Razorback Harbor, no. 535 (A); on slaty talus slope, Rowsell Harbor, no. 534 (A & O); Ogualik Island, no. 536 (B); in the Valley of the Twin Falls, no. 533 (A).

ERIGERON UNALASCHENSIS (D. C.) Vierh. See Malte, RHODORA, xxxvi. 190 (1934). On slaty talus slope, Rowsell Harbor, no. 537 (A & O); just below the easterly summit of the Bishop's Mitre, Kaumajet Mountains, no. 538 (A).

ANTENNARIA HUDSONICA Malte, *fide* M. O. Malte. For a consideration of this and the following species see Malte, RHODORA, xxxvi. 101 (1934). On the ridge south of East Bay, Ikordlearsuk, no. 547 (A & O); dry gravelly slopes of Near Island (Amiktok), Kangalaksiorvik, no. 549 (A).

A. CANESCENS (Lange) Malte, *fide* M. O. Malte. Dry gravelly slopes of Near Island (Amiktok), Kangalaksiorvik, no. 554 (A); steep, wet, cold bank of the "K" River, Kangalaksiorvik, nos. 552, 553 (A); moist gully in cliff on the north side of Razorback Harbor, nos. 556, 556a (A).

A. LABRADORICA Nutt., *fide* M. O. Malte. See Fernald, RHODORA, xxxiii. 222 (1931). Near the top of Precipice Mountain, Torngat Mountains, no. 543 (A)—identity doubtful; in the Valley of the Twin Falls, Kaumajet Mountains, no. 550 (A).

A. ANGUSTATA Greene, *fide* M. O. Malte. Scree on the south side of Peak 19, The Four Peaks, nos. 545, 545a (A); dry gravelly slopes, Near Island (Amiktok), Kangalaksiorvik, no. 546 (A); small spur on the southwest side of Mount Tetragona, no. 542 (A); summit of "K-2," north side of Komaktorvik, nos. 541, 541a (A); steep, wet, cold bank of the "K" River, Kangalaksiorvik, nos. 540, 540a (A); top of the ridge north of the harbor, Razorback Harbor, no. 548 (A); scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 544 (A); on slaty talus slope, Rowsell Harbor, no. 539 (A & O).

A. PYGMAEA Fernald. See Fernald, RHODORA, xvi. 129 (1914) and RHODORA, xxvi. 99 (1924). Base of "K-2," north side of Komaktorvik, no. 561 (A); steep, wet, cold bank of the "K" River, Kangalaksiorvik, no. 560 (A); on slaty talus slope, Rowsell Harbor, no. 559 (A & O); Valley of the Twin Falls, Kaumajet Mountains, no. 558 (A).

A. isolepis Greene. Dry hillside, west shore of the island, Kikkertaksoak, Saglek, no. 562 (A).

A. sp. unidentifiable, *fide* M. O. Malte. Moist gully in cliff on the north side of Razorback Harbor, no. 555 (A); on slaty talus slope, Rowsell Harbor, no. 551 (A & O).

Gnaphalium supinum L. Half way down the scree on the south side of Peak 19, The Four Peaks, no. 564 (A); scree slide from the top of Precipice Ridge to Komaktorvik Lake, no. 563 (A).

The only other collection from the coast of Labrador is that made by *Sornborger* at Rama in 1897.

Artemisia borealis Pall. Valley of the Komaktorvik River, no. 566 (A); on slaty talus slope, Rowsell Harbor, no. 565 (A & O).

A. borealis Pall., var. latisecta Fernald. See Fernald, Rhodora, xxix. 93 (1927). Dry, gravelly slopes, Near Island (Amiktok), Kangalakasiorvik, no. 567 (A).

Arnica terrae-novae Fernald. See Fernald, Rhodora, xxxv. 365 (1933). Moist, meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 572 (A); moist gully in cliff on the north side of Razorback Harbor, no. 573 (A); slaty talus slope, Rowsell Harbor, nos. 570, 571 (A & O).

A. plantaginea Pursh. See Fernald, Rhodora, xxvi. 104 (1924). On slaty talus slope, Rowsell Harbor, no. 569 (A & O); moist, sphagnous tundra, Rodney Mundy Island, Indian Harbor, no. 568 (A & H).

Senecio pauciflorus Pursh. See Fernald, Rhodora, xxvi. 116 (1924). Valley of the Komaktorvik River, no. 575 (A); Valley of the Twin Falls, Kaumajet Mountains, no. 574 (A).

S. palustris (L.) Hook. Moist bottom of a recently desiccated pool on the seaward side of the island, Battle Harbor, no. 576.

Immature specimens, kindly determined by Professor Fernald.

Taraxacum lacerum Greene, *fide* M. L. Fernald. See Fernald, Rhodora, xxxv. 378 (1933). Lakeside meadow at foot of ridge south of East Bay, Ikordlearsuk, nos. 593, 594 (A & O); moist, meadowy hillsides, Near Island (Amiktok), Kangalaksiorvik, no. 595 (A); top of ridge north of harbor, Razorback Harbor, no. 596 (A); moist gully in cliff on north side of Razorback Harbor, nos. 583, 597 (A); base of hill back of Moravian Mission, Hopedale, no. 592 (A & H).

T. lapponicum Kihlm., *fide* M. L. Fernald. See Fernald, l. c. 383. Shore of lake at base of hill south of East Bay, Ikordlearsuk, no. 585 (A & O); moist hillside above tundra near the anchorage, Ryan's Bay, nos. 588, 589 (A & O); dry, gravelly slopes, Near Island (Amiktok), Kangalaksiorvik, no. 591 (A); base of "K-2," near "K" River, no. 578 (A); moist gully in cliff on north side of Razorback Harbor, nos. 582, 584, 590 (A); moist crevice in hillside near harbor, Rodney Mundy Island, Indian Harbor, no. 598 (A & H).

T. sp. (unidentifiable) *fide* M. L. Fernald. Valley of the Komak-

torvik River, no. 587 (A); Ogualik Island, nos. 586, 586a (B); Valley of the Twin Falls, Kaumajet Mountains, no. 581 (A); base of the hill back of the Moravian Mission, Hopedale, nos. 579, 580 (A & H).

Crepis nana Richards. On the lower ridge above the Valley of the Twin Falls, Kaumajet Mountains, no. 599 (A).

This collection is a single individual of a very rare species. It was growing in the exceedingly well-drained gravel formed by the decomposition of the basic rocks of the Mugford series. Although an extensive search was made for other individuals, none were found. It is of interest that it is also very rare and local in Newfoundland as Professor Fernald[1] indicates in his dramatic description of its discovery on the dry limestone barrens of Burnt Cape. The only other records in eastern North America for this rarity are from Rama on the coast of Labrador where it was collected in 1897 by *Sornborger,* and in 1899 by *Stecker,* from an outcrop of slate.[2] There is still another record of a very ambiguous nature in the Gray Herbarium. A single plant of *Crepis nana* has associated with it a label which indicates that it was collected by "Waitz" at "O. Kuk," Labrador and also by "Wietz" at Northumberland Bay. Under the circumstances this specimen with its dual data can hardly be considered. As far as we have good records this interesting little plant appears to occur only on areas of basic rock in eastern North America.

University of Minnesota,
Minneapolis.

THE PRODUCTION OF SEED BY EUPHORBIA CYPARISSIAS

W. C. Muenscher

An illustration of a common weed in which the production of seeds is thought to be of rare occurrence is *Euphorbia Cyparissias,* commonly known as Cypress Spurge or Graveyard Weed. This plant was one of the early introductions into America and was formerly extensively planted as an ornamental. The distribution and spread of this perennial by vegetative propagation by its roots has been pointed out by Deane, who believed that, "the plant has in a great measure lost its power of setting fruit, at least in America."[3] Deane recorded the production of seeds by *Euphorbia Cyparissias* at Shelburne,

[1] Rhodora, xxviii. 103–104 (1926).

[2] Fernald and Sornborger, Ottawa Nat. xiii. 107 (1899).

[3] Deane, W. Rhodora **12**: 57–61. 1910.

N. H. Other cases of seed production were reported from Pittsfield, Massachusetts in 1925[1] and from Franklin, St. Lawrence, Herkimer and Orange Counties in New York in 1931.[2]

Several years ago while I was attempting to determine the conditions necessary for the formation of seeds in *Euphorbia Cyparissias* an explanation of the problem was suggested in the following statement: "About 35 years ago we seeded a dry hillside with a mixture of grass seed recommended for such soils, which was evidently heavily infested with seed of Cypress Spurge (*Euphorbia Cyparissias*) as this plant appeared throughout the entire field the following season and has flourished there and spread to surrounding fields ever since that time. This plant was often found growing in old cemeteries but this was the first instance where we had known it to take possession of fields which were mowed or pastured."[3]

In western New York the Cypress Spurge is widespread as a weed but each infestation may be assumed to represent the offspring from a single piece or root, or a patch that was started vegetatively. Many, if not most, of the infestations in a locality may represent the offspring from pieces of root, all originating from a single plant—the offspring from a single seed—a clone. No seeds are formed.

In the extensive and spreading infestations at Pittsfield, Mass. and in eastern New York, the Cypress Spurge was started from seeds—each of these infestations represents the offspring from numerous plants. Here seeds are produced in abundance.

By assuming that the Cypress Spurge is self sterile, the conditions mentioned for western New York would prevent seed formation and the conditions in the eastern infestations mentioned would account for the production of seeds. To test this hypothesis 2 series of experiments were made.

First, colonies of Cypress Spurge were started from 22 localities within a radius of 20 miles of Ithaca, Tompkins County, New York, where no seeds were known to have been produced. None of these colonies produced seed when self pollinated; 19 colonies failed to produce seed when pollinated with their own pollen or with each others' pollen. The other 3 colonies were unable to fertilize each others, flowers but produced pollen which would fertilize the other 19 so that they would produce seeds. When plants of these 3 colonies

[1] Lombard, T. L. Pittsfield, Mass. Letter and specimen dated May 9, 1925.
[2] Muenscher, W. C. and Bassett Maguire. Rhodora 33: 165–167. 1931.
[3] Crabtree, John A. Montgomery, N. Y. Letter dated July 18, 1930.

were pollinated with pollen from any one of the 19 colonies, seeds were produced. This behavior leads to the conclusion that the 22 colonies tested represent offspring from only 2 seeds.

Second, plants were started from seed. Each seedling was grown with precautions so that its root-system could not intermingle with that of the other seedlings. At the age of one year, the root-system of each of 20 seedlings was divided into 2 parts. One half of each seedling was used to start an isolated colony on some abandoned farm-land and the corresponding half of each seedling was planted in a row in my garden. The isolated colonies representing the offspring from single seeds have been under observation for 3 years without a single seed having been produced. These patches correspond to the patches in and about the cemeteries of Tompkins County and are sterile. The colonies in the garden produced abundant seed every year. However, those flower clusters which had been bagged produced seed only when cross pollinated and not when selfed. These patches correspond to the areas in eastern New York each of which had been started from several seeds.

It appears that the failure of seed production by Cypress Spurge under certain conditions is due to self sterility and the ability to produce seed by this species is not affected by its highly developed method of vegetative reproduction whereby it may reproduce and spread for many years. The evidence here presented indicates that if a colony represents offspring from a single seed it is barren, but if a colony represents the offspring from several seeds it fruits freely and produces viable seeds in abundance.

Cornell University.

Small's "Ferns of the Vicinity of New York."[1]—For a long time Dr. Small has had an especial interest in ferns. Amateurs and students of the group in the northeastern United States may congratulate themselves that this interest has lured him from his usual field in the South into their territory. For the result is a compact, handy and excellent manual of fernworts which, though it treats directly only the New York local flora area (a circle with a radius of 100 miles and the city as center), will serve quite adequately for most of New England and a considerable fraction of the Middle States. It comes at a time when most of the familiar fern books are out of print; and it is one of the few of its kind written by a competent and experienced professional botanist.

About 90 species are keyed, described and illustrated (except *Isoetes*) with neat and accurate line drawings, mostly by Miss Grace George.

[1] Small, J. K. Ferns of the Vicinity of New York. 285 pp., figs. The Science Press, Lancaster, Pennsylvania. $2.50.

According to Dr. Small's usual habit, the descriptions are supplemented by much collateral information, historical, cultural and geographic. An introduction discusses briefly the botanical history of ferns, the topographic divisions of the New York area and the groups of species to be found in each. A full list of synonyms, including a good many varieties and forms not mentioned in the text, is appended and should be useful—even though it persists in the bibliographically inaccurate habit of attributing trinomial names to authors who never used them.

Naturally the book reflects Dr. Small's well-known taxonomic and nomenclatural views. The "untidy" genus *Dryopteris* is set in order by dividing it into three. *Athyrium* also becomes three, one of them a wholly new genus, *Homalosorus*, erected for the narrow-leaved spleenwort. Following Clarkson, *Dryopteris spinulosa*, var. *americana* is treated as a separate species, *D. campyloptera*. The duplicate binomial, *Thelypteris Thelypteris* is both unfamiliar and illegitimate according to present generally accepted rules. However, a comparative list of names in this work, Gray's Manual and the Illustrated Flora makes it easy to correlate nomenclatural novelties—and they are not many. In the ferns here treated, the agreement between the old American code and the revised international rules is well-nigh complete.

Although the proof was read by no less than four highly competent colleagues as well as by the author, an occasional minor error has managed to run the gauntlet. *Botrychium multifidum* (p. 170) is not "American only"; it was originally described from Siberia. *Lycopodium flabelliforme* was not "named in 1753" but in 1901. The figure of *Botrychium obliquum* illustrates rather the variety *tenuifolium* than the typical form described in the text. But such slips are few and of little import. The book may be used with confidence and enjoyment; it should have a long and serviceable life.—C. A. Weatherby, Gray Herbarium.

Ipomoea heptaphylla in Georgia and Mexico.—Among the plants I had the opportunity of collecting on a recent journey through the southeast part of the United States, there was found a specimen of *Ipomoea heptaphylla* (Rottl. & Willd.) Voigt. This plant was collected (Oct. 9th, 1934) half a mile from Macon, Ga. along the Ocmulgee River, climbing on a *Solidago*. Thus, it extends somewhat the known area of distribution of the species, which occurs in the Old World Tropics, in continental tropical America, Cuba, Jamaica, Antigua, Guadeloupe and Curaçâo, St. Thomas and Puerto Rico, and in the United States (according to Small, Man. of Southeastern Flora, 1087, 1933) only in Louisiana, near New Orleans. It is interesting to note that the only specimen of *Ipomoea heptaphylla* from continental America preserved in Field Museum Herbarium of Chicago was collected by *Lundell* (no. 979) at Tuxpeña, Campeche. So far as I know, the plant has not been reported for Mexico.—Charles Baehni, Genève.

Volume 38, no. 447, including pages 77–100, was issued March 3, 1935.

Aerial View of The Bishop's Mitre, Kaumajet Mountains, from the North, 1931 (*courtesy of* Professor Alexander Forbes and The American Geographical Society). Fig. 1, Mugford Tickle; fig. 2, Ogualik Island; fig. 3, East Peak of The Bishop's Mitre; fig. 4, West Peak of The Bishop's Mitre; fig. 5, Odell's Peak, southwest of the Bishop's Mitre; fig. 6, Brave Mountain.

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No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

Photo. E. C. Ogden.

Potamogeton tennesseensis: fig. 1, fruiting top, × 1; fig. 2, submersed foliage, × 1; fig. 3, stipule and base of submersed leaf, × 10; fig. 4, upper half of submersed leaf, × 10, by transmitted light; fig. 5, fruiting spike, × 4; figs. 6 and 7, mature fruits, × 10.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXIII.

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(Plates 412–434)[1]

During the studies necessary in a thorough revision of Gray's *Manual* much new or newly interpreted matter is inevitably accumulated. The following items assembled during the past two years are here published in the more extended form which, of course, will be impossible in the condensed work, when eventually finished. In a few cases, the new *Potamogeton* for instance, plants slightly outside the manual-range are discussed.

I. A NEW PONDWEED FROM TENNESSEE

In May, 1933, Professor H. M. Jennison, swimming across Clear Fork River in Morgan County, Tennessee, found himself dragging ashore strands of a flowering pondweed, of which he brought material to the Gray Herbarium. In my recent *Linear-leaved North American Species of Potamogeton*[2] there was no provision for Jennison's plant, unless under *P. bicupulatus.* The material was barely in flower, but it lacked the rounded axillary lower spikes and had much longer-peduncled emersed spikes and larger floating leaves with 9–23, instead of 5–7 nerves. The plant not being *P. bicupulatus,* I suggested the possibility that it might be the long unknown and wholly provisional

[1] The photography and preparation of the engraver's blocks have been made possible through grants to the author from the Milton Fund for Research and the Wyeth Fund of the Division of Biology, both of Harvard University. The cost of reproduction in Rhodora has been most generously defrayed by Mr. Bayard Long.

[2] Mem. Am. Acad. xvii[1].—Mem. Gray Herb. no. iii. (1932).

P. Purshii Tuckerm. Am. Journ. Sci. ser. 2, vi. 228 (1848). Now, thanks to the activity of Dr. H. K. Svenson, we have a fine suite of material of Jennison's plant in fruit and some in flower showing that it is a species unique in many characters and as closely allied to the subsection *Nuttalliani* (*P. epihydrus* Raf.) as to the subsection *Hybridi* (*P. bicupulatus* Fern., *P. capillaceus* Poir., etc.), in fact standing midway between those two American subsections. Its adnate stipules and linear-filiform, flaccid, submersed leaves without lateral nerves show, also, that it is not wholly unrelated to the primitive subgenus *Coleogeton*.

As to the name *Potamogeton Purshii*, I expressed myself in 1932. The name was published as a provisional one of Tuckerman's, meant to clinch the naming of the species, should some one later carefully work it out:

The upshot was that upon Pursh's sterile and perhaps unidentifiable specimen Tuckerman made a provisional species: "Should the fruit confirm its apparent claims to be considered a species, it may not inappropriately take the name of *P. Purshii*."

The type of *P. Purshii* has not been studied by subsequent authors and many guesses have been made as to its identity. On account of its inclusion by Tuckerman under his discussions of *P. Claytonii* it has often been supposed to belong with that (*P. epihydrus*, var. *Nuttallii*); but the submersed leaves, as described by Tuckerman, are altogether too narrow. Graebner in Engler, Pflanzenr. iv^{11}. 45 (1907) took up *P. Purshii* of "Virginia and Carolina" without question for the boreal species, *P. Oakesianus* Robbins (Newfoundland and the Labrador Peninsula to the Adirondacks, etc., south to New Jersey). Obviously, *P. Purshii* cannot be the latter more northern plant; and its identification must await study of the type. Tuckerman deposited material in many herbaria of his time and the type of *P. Purshii* has not yet been located.

As already stated, *provisional* names, such as *P. Purshii*, are a nuisance. Their authors put them forward in order to occupy the field in case they eventually prove to be worth taking up. Unfortunately, the proposition put forward at the International Congress at Cambridge to reject such names as not validly published, did not win the support it deserved. Until we are allowed to reject such names they will always be a source of uncertainty and instability. The more sources of doubt we can eliminate the sounder will be our nomenclature. In this case, however, with *P. Oakesianus* not found in Virginia and Carolina, it is not probable that the ill-advised name *P. Purshii* will be more than a recurring annoyance.

Although these provisional names were not excluded at the International Congress at Cambridge (1930), they were, most happily, ruled out at Amsterdam (1935). The vague and unsatisfactorily published *Potamogeton Purshii* thus disappears and the question whether Jennison's and Svenson's material belongs to it becomes merely an academic

one except for the geographic interest of knowing whether Tuckerman's plant of "slow flowing streams of Virginia and Carolina" is the same. At any rate, the Tennessee plant may appropriately take the name

POTAMOGETON **tennesseensis**, sp. nov. (TAB. 412), caulibus tenuissimis ad 1.5 mm. diametro 3–6 dm. longis subsimplicibus vel valde ramosis; foliis submersis flaccidis lineari-filiformibus 0.2–0.6 mm. latis uninerviis vel obsolete trinerviis valde lacunatis apice attenuatis basi stipulis hyalinis convolutis obtusis adnatis; foliis natantibus lanceolatis vel lanceolato-oblongis acutis, petiolis plerumque quam lamina foliorum valde longioribus, laminis 2–4 cm. longis 5–13 mm. latis 9–23-nerviis, nervis subtus impressis; pedunculis crassis clavatis 3–8 cm. longis adscendentibus; spicis cylindricis 1–2.2 cm. longis, maturis 4.5–6 mm. crassis; connectivis unguiculatis 2 mm. longis limbo oblatis 1.5 mm. latis; fructu quadrato-orbiculato a latere compresso 3-carinato 2.5–3 mm. longo 2–2.5 mm. lato, basi truncato 0.8–1 mm. lato, dorso semi-orbiculato alato-carinato, carina acuta 0.5–0.8 mm. lata, integra vel remote obtuseque dentata, carinis lateralibus acutis integris, ventre convexo obtusanguli, lateribus inter carinis lateralibus latis planis, rostro marginale erecto 0.4 mm. longo.—TENNESSEE: Clear Fork River, 1 mile north of Rugby, Morgan County, May 28, 1933, *H. M. Jennison*, no. 33–139 (flowering material); abundant in eddies of a rapid stream, Clear Fork, Clarkrange, 20 miles south of Jamestown, Fentress County, July 11, 1935, *H. K. Svenson*, no. 6756 (TYPE in Gray Herb.; isotypes in Herb. Brooklyn Bot. Gard. and elsewhere); Daddy's Creek, by mill south of Crossville, Cumberland County, July 20, 1935, *J. K. Underwood & A. J. Sharp*, no. 2961.

Potamogeton tennesseensis, known only from streams of the Cumberland Plateau, at altitudes from 1400 feet (Rugby) to about 1900 feet (Crossville), is a remarkably interesting plant. It bridges the gap which has hitherto clearly separated the *Hybridi*, a purely American subsection of § *Axillares*, and the subsection *Nuttalliani* (*P. epihydrus* Raf.), widely dispersed over temperate North America and reported (though doubted) from Japan. In its almost capillary, submersed leaves (FIG. 2) adnate to the bases of the stipules (FIG. 3) and in the production late in the season of tufts of subcapillary leaves (FIG. 1) from among the dilated ones it inevitably suggests *P. capillaceus* Poir. and the local Alleghenian *P. bicupulatus* Fernald of the *Hybridi;* and the adnate stipules and simple leaf-structure also suggest *P. filiformis* and other members of subgenus *Coleogeton.* Its floating leaves, too, suggest those of *P. capillaceus* and *P. bicupulatus* but they are larger and with 9–23 nerves, the dilated leaves of *P. capillaceus* having 3–7, of *P. bicupulatus* 5–7 nerves. In the number of nerves

these leaves of *P. tennesseensis* more nearly approach those of *P. Spirillus* Tuckerman (5–15) and of *P. diversifolius* Raf. (7–15), but in those species the dilated leaves are blunt or emarginate and the narrowly ribbon-like submersed leaves blunt and at base more adnate to the stipules. In the *Hybridi* all the species have few-flowered and subglobose, sessile or barely peduncled spikes in the axils of the submersed leaves; these are quite wanting in *P. tennesseensis*. In the *Hybridi* all the species have the elongate upper spikes on peduncles but 0.2–3 cm. long and the sepaloid connectives 0.5–1 mm. long (the peduncles of *P. tennesseensis* 3–8 cm. long, the connectives 2 mm. long). In all the *Hybridi* the fruits are strongly compressed laterally, beakless or with beak a minute tooth, the form of the spiral embryo is clearly evident through the thin coat, and the fruits, 1–2.2 mm. long, are usually strongly toothed on the dorsal keel; *P. tennesseensis* has less compressed fruits (figs. 5–7) with thick coat completely hiding the form of the embryo, the beak erect and stout, the dorsal and sharp lateral keels entire or essentially so and the mature fruits 2.5–3 mm. long. In the Alleghenian *P. bicupulatus*, which it superficially resembles, the fruits have the sides, between the coarsely dentate-sinuate lateral keels and the ventral margin, cup- or craterlike; in *P. tennesseensis*, however, the sides are essentially flat and the low lateral keels entire.

P. tennesseensis, therefore, can hardly be placed in the subsection *Hybridi;* but when we turn to the *Nuttalliani* we meet with the need, if we are to place it there, of redefining the subsection. The submersed leaves of the *Nuttalliani* are ribbon-like and up to 1 cm. broad, with free hyaline stipules; but otherwise, in dilated leaves, thickened base of stem, elongate peduncles, uniform spikes and fruits, *P. tennesseensis* is better placed with *P. epihydrus* than anywhere else in our pondweeds. The general shape of the fruits, with thin, entire dorsal and lateral keels and essentially flat faces, as well as the stout, though short, beak and the curve of the embryo (not shown in the plate) all place it there.

In view of the well known concentration on the Cumberland and other Plateaus of eastern Tennessee and adjacent areas of the old Appalachian upland of relic-species of many groups (animals as well as plants), I am inclined to look upon *Potamogeton tennesseensis* as a persistent remnant of the ancestral series from which the American subsection *Nuttalliani* and the other American subsection *Hybridi*

have diverged, the first toward the development of ribbon-like and quite free submersed blades, the second retaining the adnation of the leaf-bases and stipules and the slender submersed blades but developing the small submersed (cleistogamous?) spikes and the thinner-walled fruits which characterize the subsection.

II. PILEA IN EASTERN NORTH AMERICA

Pilea pumila (L.) Gray, var. **Deamii** (Lunell), comb. nov. *Adicea Deamii* Lunell in Am. Midl. Nat. iii. 10 (1913). Plate 413, figs. 10–15.

The late Dr. J. Lunell proposed to split the temperate North American members of the genus *Pilea* Lindl. (*conserved name*), as *Adicea* Raf., into five species. His *A. fontana* and *A. opaca*, both described from Pleasant Lake, Benson County, North Dakota, have black or blackish fruits, his *A. Nieuwlandii, A. Deamii* and *A. pumila* (L.) Raf. having the fruits green to stramineous. The latter series was split on size and degree of branching of plant and size of fruit, both characters which, in an annual weedy group, are very unstable. Individuals with simple stems and low stature (15–25 cm.) were called *A. Nieuwlandii*, those with the stem taller and branching from base were treated as *A. Deamii* and *A. pumila;* but no provision was made for plants with low stature and branching stems and for individuals with simple and tall (sometimes 5–6 dm. high) stems, such as are familiar to every observant field-botanist. As typical *A. pumila* Lunell chose a series of plants from the Potomac Valley, with "Stem reaching a length of 6 dm., with later on spreading branches" and with the leaves 8–16-toothed on each margin. Lunell was not much influenced by the elementary facts, that the basic *Urtica pumila* L. Sp. Pl. 984 (1753) had its "*Habitat in* Canada" and with "Caulis *digiti altitudine*, simplex," for he dismissed these matters as "indicating that Linnaeus made his description from an immature or poorly nourished specimen"; but, getting material of a "Planta 15–25 cm. alta, simplex . . . Folia . . . dentibus 4–7 crasse crenato-serrata," Lunell did not hesitate to describe it as a new species, *A. Nieuwlandii.* Now, it so happens that the Canadian material before me (11 nos.) has stems varying from a "finger's length and simple (Caulis *digiti altitudine*, simplex)" to taller and branching, 0.6–4.5 dm. high, and the leaves have 3–9 coarse rounded teeth on each margin. This is unquestionably *Urtica pumila* L., therefore *Pilea pumila* (L.) Gray.

Typical *Pilea pumila,* with leaves usually cuneate at base and with the largest blades with 3–11 coarse rounded teeth (FIGS. 1–5) is common in southern Canada, from Prince Edward Island to southern Ontario, extending south to Pennsylvania (and locally to Virginia), Tennessee, Iowa and South Dakota. In the South, from Florida to eastern Texas, extending northward to western New York, Ohio, Indiana, Illinois, Missouri and Kansas, *P. pumila* has the leaves (FIGS. 10–13) more often rounded at base, the teeth usually less rounded or even acute and those of the larger leaves numbering 11–17. It is this plant of wide southern and inland range that Lunell described as *Adicea Deamii* "Folia . . . dentibus 6–12 crasse crenato-serrata, basi cuneata vel rotundata," for, although Lunell gave a maximum of 12 serrations, an ISOTYPE in the Gray Herbarium shows the larger leaves (FIG. 10) with 16. By its more commonly round-based leaves with more numerous and commonly less rounded teeth *P. pumila,* var. *Deamii* is well distinguished from typical *P. pumila;* but too many transitions occur to allow their separation as species. Their fruits (FIGS. 14, 15) are of similar shape and smoothness or with quite similar purplish markings.

As to the black-fruited plants called by Lunell *Adicea fontana* and *opaca,* it is notable that they came from the same locality, the former "found on a narrow strip along the boggy margin of a rill, in deep shade, . . . in the woodland of Pleasant Lake, Benson County, North Dakota"; the latter "in damp, but drained soil, well shaded, somewhat distant from the rill where the preceding species thrives." The plant of the boggy and unfavorable habitat grew 4–8 cm. high and was simple (the very reaction of *P. pumila* under such conditions), with "seeds 1.5 mm. long"; while the plant of better "drained soil" near-by reached a height of 3 dm. and branched and its seeds were slightly larger; therefore two species! Rydberg has taken up both of them, as *Pilea opaca* (Lunell) Rydb. in Brittonia, i. 87 (1931) and *P. fontana* (Lunell) Rydb. l. c., but in my own work I am uniting them as *P. fontana* (the name with page-priority), a species characterized by firm and hardly lustrous opaque small leaves, with relatively short petioles, the black fruits (FIG. 16), as pointed out to me by Mr. C. C. Deam, pale-margined and roughened by low knobs or bosses. It occurs from North Dakota to Nebraska, extending eastward to western New York. Frequent immature specimens of *P. pumila* have the young fruits darkened in drying, but *ripe* fruits seem to be always pale.

III. MEMORANDA ON RANUNCULUS

Ranunculus flabellaris Raf., forma **riparius**, nom. nov. *R. delphinifolius*, forma *terrestris* Glück, Beihefte Bot. Centralbl. xxxix. Abt. ii. 328 (1923), nec *R. delphinifolius*, f. *terrestris* (Gray) Blake, Rhodora, xv. 164 (1913). Plate 414, figs. 5 and 6.

Unfortunately, the name *Ranunculus delphinifolius* Torr. is not the earliest one available. One of the first definitions of the large Yellow Water-Crowfoot of America was by Jacob Bigelow, Fl. Bost. 139 (1814), who gave a very detailed and accurate account of it, but supposed it to be the Old World *R. fluviatilis* Willd. Our plant is wholly distinct from *R. fluviatilis*, as Bigelow's clear description shows, and the always watchful Rafinesque promptly seized his opportunity. In his review of Bigelow he went through the simplest motions necessary for the designation of a new species; but these were technically enough:

> *Ranunculus fluviatilis*, Big. is *R. flabellaris*, Raf. n. sp.—Raf. in Am. Mo. Mag. ii. no. v. 344 (March, 1818).

In view of the very detailed description given by Bigelow there is no question of the validity of *Ranunculus flabellaris* Raf. (March, 1818). The next name, the one currently in use, is *R. delphinifolius* Torrey in Eaton, Man. ed. 2: 395 (late Spring of 1818). This was put out by Amos Eaton with proper diagnosis and the explanatory note: "A new species by Dr. Torrey; though he suspects it may be a variety of fluviatilis." Subsequently, in Torr. & Gray, Fl. i. 20 (1838) and in his own Fl. N. Y. i. 14 (1843), Torrey treated *R. fluviatilis* Big. and *R. delphinifolius* Torr. as identical; and there seems no reason to doubt their identity. The only question is that of the dates of publication of *R. flabellaris* Raf. and *R. delphinifolius* Torr., both regularly cited simply as "1818." Rafinesque's name was in the March number of The American Monthly Magazine, this preceded by a number designated as of February, 1818, and followed by one for April, 1818; there is no obvious reason to doubt the date.

Eaton's Manual, ed. 2, bears the formal record of copyright, so frequent at that time and so rare today. Richard R. Lansing, Clerk of the Northern District of New York, made the legal memorandum:

> BE IT REMEMBERED, That on the twelfth day of May, in the forty-first year of the Independence of the United States of America, Websters and Skinners, of the said district, have deposited in this office, the title of a book, the right whereof they claim as proprietors, in the words following, to wit:
> "A Manual of Botany of the Northern and Middle States . . . By Amos Eaton, A. M. . . . Second edition, corrected and enlarged."

Eaton's Manual, ed. 2, was issued two months or more later than the March number of The American Monthly Magazine. It is probable that it was not actually distributed to the public until some time later. The copy in the library of the Gray Herbarium has this dedication on the title-page:

To Dr. Jacob Bigelow, Presented by his friend The Author, Albany, Aug. 4th, 1818.

Further evidence of the date of issue of Eaton's 2d edition is found on his p. 502, where begin the Additions and Corrections: "After 432 pages were struck off, I received Nuttall's genera of North American plants." This is significant, for Nuttall's Genera of North American Plants . . . to the year 1817, was entered for copyright at Philadelphia on April 3d, 1818:

BE IT REMEMBERED, That on the third day of April, in the forty-second year of the Independence of the United States of America, A.D. 1818, Thomas Nuttall of the said district, has deposited in this office the title, etc.

It is impossible not to note the discrepancy in the two registrations: Eaton's in the District of Northern New York in May, "in the forty-first year of the Independence of the United States"; Nuttall's in the District of Pennsylvania in April, "in the forty-second year of the Independence of the United States." This, surely, reflects only a difference in the method of calculation, not a full year's difference in the copyrights. That Eaton's 2d edition was still only in manuscript in late 1817 is shown by the letters from various dignitaries dated "Northampton, (Mass.) Nov. 24th, 1817" and used by Eaton in his Preface (p. 12).[1]

The reason for giving a new formal name instead of transferring *Ranunculus multifidus*, var. *terrestris* Gray, Man. ed. 5: 41 (1867), the nomenclatural type of *R. delphinifolius*, f. *terrestris* (Gray) Blake, l. c. (1913), must be clarified. Gray, l. c. (1867), described *R. multifidus*, var. *terrestris* from a collection made at Ann Arbor, Michigan by Miss Clark. It

differs from the ordinary emersed forms by the stems ascending from the base and paniculately several-flowered at the summit, where the leaves are reduced to oblong or linear bracts; no immersed dissected leaves.—Ann Arbor, Michigan, on muddy banks, *Miss Clark.*

[1] Of this letter Eaton said "It is only the last paragraph, which can be interesting to the public." The "interesting" paragraph follows:

"As his class consisted chiefly of ladies, and as these branches of learning have not hitherto generally engaged the attention of the sex; we take the liberty to state, that, from this experiment [Eaton's lectures to them], we feel authorized to recommend these branches as a very useful part of female education."

Every one has assumed that Gray had before him the common terrestrial form (PLATE 414, FIGS. 5 and 6) of *Ranunculus delphinifolius* Torr. (or *R. flabellaris* Raf.). Consequently, we have had the names for the terrestrial form of the latter: *R. lacustris*, var. *terrestris* (Gray) MacMillan, Metasp. Minn. Val. 247 (1892); *R. delphinifolius*, var. *terrestris* (Gray) Farwell, Ann. Rep. Comm. Parks & Boulev. Detroit, xi. 63 (1900); and the combination by Blake above noted. In general it seems to have occurred to none of these authors (nor to myself when I gave a new name to a similar plant) carefully to check the Clark material from Ann Arbor, the type of *R. multifidus*, var. *terrestris* Gray, distinctly marked by him in the Gray Herbarium. This type (our PLATE 415, FIGS. 1–3) does not belong to the coarse *R. flabellaris* or *delphinifolius*, as has been universally assumed, but is the small-flowered plant which was described as *R. Purshii* Richardson, var. *prolificus* Fern. RHODORA, xix. 135 (1917). The comparatively southern *R. flabellaris* (plate 414, FIGS. 1–4) and the more northern *R. Purshii* have very positive differences:

R. FLABELLARIS: Submersed leaves 0.3–1.5 dm. long, ternately decompound into linear-filiform segments; sepals 5–8 mm. long; petals 0.6–1.7 cm. long; anthers oblanceolate to oblong, 1–1.5 mm. long, only slightly broader than the clavate filaments; fruiting heads 8–13 mm. long; mature achenes prominently corky-thickened at base and along the ventral margin, including the beak 2.5–3.5 mm. long.—Maine to Washington, south to North Carolina, Arkansas, Kansas and California.

R. PURSHII: Submersed leaves nearly orbicular, 1.5–8 cm. broad, with 3–5 cuneate linear-cleft lobes; sepals 2.5–4 mm. long; petals 3.5–5 mm. long; anthers ellipsoid, 0.5–1 mm. long, twice as broad as the slender filaments and sharply differentiated; mature achenes not at all or but slightly corky-margined, 1.5–2 mm. long.—Labrador Peninsula to Alaska and Siberia, south to Nova Scotia, northern Maine, Michigan, Iowa, North Dakota, New Mexico and Oregon.

The type of *Ranunculus multifidus*, var. *terrestris* Gray (PLATE 415, FIGS. 1–3) belongs very definitely with *R. Purshii* (FIGS. 5–8), not with *R. flabellaris* (PLATE 414, FIGS. 1–4) and, as already noted, it is the upright paniculate-branched *R. Purshii*, var. *prolificus*. Singularly enough, the name *R. multifidus*, var. *terrestris* Gray cannot be made the basis for a varietal or formal combination under *R. Purshii*, since, in 1842, Ledebour described the terrestrial and creeping form (*R. limosus* Nutt.) of *R. Purshii*, with thick and subglabrous to villous 3–5-parted leaves as *R. Purshii*, var. *terrestris* Ledeb. Fl. Ross. i. 35 (1842) and this plant has been taken up as *R. Purshii*, f. *terrestris* (Ledeb.) Glück, l. c. 330 (1923).

RANUNCULUS AMBIGENS Wats. In 1879 Sereno Watson defined the

coarse, decumbent perennial of wet clay in the northeastern United States, the plant with lance-attenuate and very sharp-pointed leaves, as *Ranunculus ambigens* Wats. Proc. Am. Acad. xiv. 289 (1879). The plant had formerly been confused with the western *R. alismaefolius* Benth. and with the chiefly European (but in Newfoundland and Nova Scotia) *R. Flammula* L. So far as shown by the specimens in the Gray Herbarium, *R. ambigens* occurs from Maine to Illinois, south into Delaware, Maryland and Tennessee; and it is at once distinguished by its coarse, elongate, creeping stem rooting at the nodes, its upper and median leaves long-acuminate, and its achenes tipped by a subulate beak 0.6–1.5 mm. long. There is absolutely no question as to the identity of *Ranunculus ambigens;* and the name was correctly used by Watson & Coulter in Gray, Man, ed. 6, and by Gray in the Synoptical Flora.

In Britton & Brown, Ill. Fl. ii. 76 (1897) the plant is satisfactorily illustrated under the name *Ranunculus obtusiusculus* Raf. Med. Rep. ser. 2, v. 359 (1808); and under this name the species has been known by those who have neither had access to Rafinesque's illustration of his *R. obtusiusculus* nor appreciated the pertinent comments upon it in the Synoptical Flora. The latter memoranda are to the point:

R. obtusiúsculus, Raf. l. c. is equally indeterminable, even with the help of a tracing from an original sketch, possessed by the N. Y. Academy of Sciences, which is probably not true to nature, representing cauline foliage of *R. pusillus*, from an annual root, 5-merous polyandrous flowers with persistent linear-lanceolate sepals and a long style.—Gray, Syn. Fl. i¹. 20 (1895).

A tracing from Rafinesque's figure of his plant shows a slender straight erect stem and single annual root, also linear-lanceolate sepals, all at variance with the stout decumbent commonly geniculate and copiously rooting stem and ovate sepals of the present species. Gray, l. c. 27 (1895).

Rafinesque's original diagnosis is here given:

10. Ranunculus obtusiusculus, obtuse ranunculus; stem upright, simple; leaves petiolated, lanceolated, semi-obtuse, flowers few, terminal. In New-Jersey in marshy places.

That Rafinesque's drawing of an *annual*, with bluntish leaves, leafy-bracted peduncles, gamopetalous corolla, linear or linear-lanceolate sepals, and rounded obovate petals (his fig. 2), is not a recognizable illustration of *R. ambigens*, which is a coarse and obvious perennial, with attenuate leaves, bractless peduncles, ovate sepals and distinct (as in all the genus) oblong petals, should be obvious. Whether Rafinesque's drawing was made from actual material before him may

well be doubted; at least the drawing is so unlike anything now known in Nature that it is probably futile to guess about it, as futile as in many other Rafinesquian propositions. Except for the alternate leaves the drawing of the habit could as well have been made from a vague recollection of *Lysimachia* (*Steironema*) *lanceolata* as from *Ranunculus ambigens*. At any rate, to reject the carefully described *R. ambigens* and to take up for it the wholly vague *R. obtusiusculus* leads directly away from clarity into hopeless obscurity.

Ranunculus laxicaulis (Torr. & Gray) Darby, Bot. So. States, 204 (1860), the name taken up in Gray's Manual, ed. 7, may or may not be *R. ambigens*. Darby's own description of a plant from "Ditches Car. to Geo. July" suggests it in some points but Darby's material is unknown; nomenclaturally his species rests upon *R. Flammula*, β. *laxicaulis* Torr. & Gray, Fl. N. Am. i. 16 (1838), the account of which follows:

> β. *laxicaulis:* stem weak, much branched; leaves all entire; lowest ones elliptical-oblong, upper ones linear; petals oblong, attenuate at the base, three times as long as the calyx . . . β. Milledgeville, Georgia, *Dr. Boykin!*

The Boykin specimen, type of *R. Flammula*, β. *laxicaulis* is not at the Gray Herbarium and Dr. Gleason writes me that it cannot be found in the Herbarium of the New York Botanical Garden. Nor have I seen in either herbarium any material from the Atlantic States from south of Delaware and Maryland, although there is a specimen without detailed data at New York said on the copied label to be from Georgia. This, however, is one of the many unlocalized sheets from Chapman, too many of which are open to doubt. The petals of *R. ambigens* only slightly exceed the sepals (sepals 5–7 mm. long, petals 5–8 mm. long); but Torrey & Gray described the "petals . . . three times as long as the calyx." They also had "a weak much branched" plant with "leaves all entire," not a convincing description of the coarse stem (0.5–2 cm. thick at base), simple or only slightly forking, of *R. ambigens*, which has the middle and upper leaves toothed. Their description suggests *R. oblongifolius* Ell.; at least it is unwise to maintain *R. laxicaulis* for the undoubted *R. ambigens*.

Ranunculus rhomboideus versus R. ovalis. *Ranunculus rhomboideus* Goldie in Edinb. Phil. Journ. vi. 329—Reprint, 11—, pl. xi. fig. 1 (1822), well described and clearly illustrated by its discoverer, who found it "In dry sandy fields, near Lake Simcoe, Upper Canada

[Ontario Co., Ontario]," is a wide-ranging prairie species which occurs from eastern Alberta to Colorado, thence across the prairies to Ontario, Michigan and Illinois. Goldie correctly showed it with characteristically toothed leaves and it has regularly been thus correctly described or illustrated by later authors. In 1814 Rafinesque gave a characteristically inexact and unrecognizable description of

Ranunculus ovalis. Feuilles radicales à longs pétioles, ovales, entières, velues, aigues, les caulinaires rares sessiles lancéolées, fleurs terminales peu nombreuses. *Dans le Canada et Genessee.*—Raf. Précis des Découvertes, 36 (1814), reprinted in Desv. Journ. de Bot. iv. (or vi.), 268 (1814).

A. P. DeCondolle, to whom Rafinesque sent many of his species, could make nothing of *Ranunculus ovalis* and placed it in his "*Ranunculi non satis noti*"—DC. Prodr. i. 43 (1821); but, unfortunately, Hooker, although taking up *R. rhomboideus* Goldie, tried to keep apart from it as species two variations which subsequent experience shows to be mere phases of *R. rhomboideus.* These phases of one species, treated by Hooker as three species, were *R. rhomboideus, R. ovalis* "*Rafin.* . . . ?" and *R. brevicaulis* Hook. Fl. Bor.-Am. i. 13, t. vii. A (1829). Hooker gave a good plate of what he took to be Rafinesque's *R. ovalis* as his t. vi B, a fine representation of luxuriant *R. rhomboideus,* which looks as if it might almost have come from Goldie's series of specimens. Hooker, showing the regularly dentate and obtuse basal leaves of *R. rhomboideus,* made the comment: "This species is not at variance with the short character given in Journ. de Bot. of Rafinesque's *R. ovalis,* except that he states the cauline leaves to be lanceolate; by which he means, perhaps, that the segments are so." To render the interpretation of Rafinesque's account more thorough he should have added: "and except that Rafinesque said 'Feuilles radicales . . . entières, . . . aigues', by which he meant, perhaps, radical leaves dentate, obtuse, and except that Rafinesque's plant came in part from Genessee (a county of northwestern New York, organized in 1802), whence no collections have ever been known to the botanists of the State of New York."

The identity of Rafinesque's *Ranunculus ovalis* is utterly vague; but to take up his name of a plant with entire and acute basal leaves and lanceolate cauline ones, a plant said to come from Genessee, for the well defined *R. rhomboideus,* seems like straining for vagueness and inaccuracy. This, however, is done in the Illustrated Flora, where the plant called *R. ovalis,* without interrogation, is shown and described

with "basal leaves . . . crenate or slightly lobed, obtuse, . . . upper cauline leaves . . . deeply divided . . . into 3–7 linear or oblong obtuse lobes"; and the range given, correctly, definitely excludes Genessee. My reasons for maintaining *R. rhomboideus* need no further statement.

Ranunculus septentrionalis Poir., var. **caricetorum** (Greene), comb. nov. *R. caricetorum* Greene, Pittonia, v. 194 (1903). *R. sicaeformis* Mackenzie & Bush in Torreya, vi. 123 (1906).

The wide-ranging *Ranunculus septentrionalis* varies, like most members of § *Euranunculus*, in the degree of pubescence and the direction of its trichomes. It may be quite glabrous, sparingly to copiously appressed-pubescent or sparingly to copiously spreading-hirsute. In the large series from eastern Canada and the northeastern states westward to Manitoba and Nebraska I get no clear lines by which to differentiate the smoother and the more hirsute extremes. Either quite glabrous or very densely hirsute plants occur in Quebec, New England and the Great Lakes region. Var. *caricetorum*, confined so far as I have seen material, to the region from south-central Ohio to Missouri, Iowa and Minnesota has the densest of hirsuteness and this is largely retrorse. In the great density and reflexing of its pubescence the variety is unique; but I find no other characters to separate it from the general run of hirsute or hispid *R. septentrionalis*.

In the effort to brace the specific claims of the retrorsely hirsute plant overemphasis has been given the glabrousness of some specimens of *Ranunculus septentrionalis*. Thus, in his Flora of the Prairies and Plains, Rydberg gives the key differences:

Stem glabrous or nearly so	17. *R. septentrionalis.*
Stem decidedly hispid	18. *R. caricetorum.*

R. caricetorum Greene, Pittonia, v. 194 (1903) was described from "the region of the Great Lakes, from perhaps Ontario to Iowa and Minnesota, . . . diagnosis . . . from material of my own gathering in southern Wisconsin in 1888, and in southern Michigan in 1902": "commonly very hirsute, at least as to petioles and lower part of stem, otherwise sparingly hirsute-pubescent." Rydberg maintains *R. caricetorum*, correctly reducing *R. sicaeformis* (as *R.* "*sicaefolius*") to it. The two are identical, but Greene said nothing of the copious retrorse pubescence on leaves and peduncles exhibited by his type-material, and also by the type and the other Missouri specimens of *R. sicaeformis*. Greene said of his Great Lakes plant,

"commonly very hirsute, at least as to petioles and lower part of stem, otherwise sparingly hirsute-pubescent," so that it is clear that he did not understand the true character of his type. Just such plants as Greene's description implies are common about the Great Lakes, thence north to Hudson Bay and east to New England and Quebec. But Mackenzie & Bush were more explicit, saying the "whole plant very strongly whitish or yellowish hispid-pubescent." Besides the type material, they cited also a specimen from Hennepin Co., Minnesota. The latter is like the type of *R. caricetorum*, a photograph of which has been most generously presented to the Gray Herbarium by Dr. Stuart K. Harris, who secured it while visiting Greene's herbarium in 1935. As I view the plants, there is little significance to the degree of pubescence on the stems and petioles; but the plant with dense and *retrorse* pubescence in the southwestern edge of the specific range is very definite.

As to Rydberg's characterization of *Ranunculus septentrionalis* as having "Stem glabrous or nearly so," it is significant that Poiret, in his original description of *R. septentrionalis* said very definitely: "*caule petiolisque basi hirsutis*" and "les tiges . . . velues ou pubescentes à leur partie inferieure." A tracing of Poiret's type in the Gray Herbarium settles its specific identity.

Ranunculus fascicularis Muhl., var. **apricus** (Greene), comb. nov. *R. apricus* Greene, Pittonia, iv. 145 (1900).

Very distinct in the region from Mississippi to Oklahoma and Texas, Greene's *Ranunculus apricus* passes northward very clearly into *R. fascicularis*, the plants from Michigan to Iowa having to be somewhat arbitrarily sorted.

IV. THE NOMENCLATURE OF SASSAFRAS

Enough changes have recently been made in the "proper" specific name of *Sassafras* to suggest that its nomenclature partakes of its nature, as reflected in the illegitimate names *Laurus variifolia* Salisb. and *L. diversifolia* Stokes. One of the most recent discussions of the names is that of Blake, *Note on the proper Name for the Sassafras*, Rhodora, xx. 98 (1918). There Blake pointed out, correctly, that the name *Laurus variifolia* Salisb. (1796) was a mere substitute for *L. Sassafras* L. (1753) and, since there was already a valid specific epithet under *Laurus*, Salisbury's name was illegitimate. Blake, therefore, concluded that "The valid name to replace it is Sassafras

OFFICINALE Nees & Eberm. . . . (1831)." Unfortunately, however, Blake's usually keen logic suffered a momentary and unprecedented lapse, for immediately after asserting that the earliest *valid* name was published in 1831, he made a varietal combination under it, *S. officinale*, var. *albidum* (Nutt.) Blake, based upon Nuttall's species, *Laurus* (*Euosmus*) *albida*, published in 1818. So far as I can yet determine the first *valid* specific epithet for the aggregate species was that of Nuttall and I see no way, under the International Rules, to avoid taking up for the variable species the combination *Sassafras albidum* (Nutt.) Nees, Syst. Laurin. 490 (1836). The bibliography follows:

SASSAFRAS ALBIDUM (Nutt.) Nees, Syst. Laurin. 490 (1836); Raf. Aut. Bot. 86 (1840). LAURUS (EUOSMUS) ALBIDA Nutt. Gen. i. 259 (1818). *Evosmus albida* "Nutt." acc. to Spreng. Syst. ii. 267 (1825) as synonym. *Tetranthera albida* (Nutt). Spreng. Syst. ii. 267 (1825). *Euosmus albida* "Nutt." acc. to Jackson, Ind. Kew. ii. 914 (1893). *S. variifolium*, var. *albidum* (Nutt.) Fernald in RHODORA, xv. 16 (1913). *S. albidum*, var. *glauca* Nieuwl. in Am. Mid. Nat. iii. 347 (1914). *S. officinale*, var. *albidum* (Nutt.) Blake in RHODORA, xx. 99 (1918).

Var. **molle** (Raf.) comb. nov. *Laurus Sassafras* L. Sp. Pl. 371 (1753). *L. Salsafraz* Noronha in Verh. Batav. Gen. v. (1790), Art. iv. 19, modification in spelling. *L. variifolia* Salisb. Prodr. 344 (1796), substitute for *L. Sassafras* (illegitimate). *L. diversifolia* Stokes, Bot. Mat. Med. ii. 426 (1812), substitute for *L. Sassafras* (illegitimate). *S. officinarum* J. S. Presl. Rostl. ii. 68 (1825), not seen. *Persea Sassafras* (L.) Spreng. Syst. ii. 270 (1825). *S. officinale* Nees & Eberm. Handb. Med.-Pharm. Bot. ii. 418 (1831). *S. rubrum* Raf. Sylva Tell. 134 (1838), name only (application inferred). *S. triloba* Raf. Aut. Bot. 85 (1840), based on *Laurus Sassafras*. S. TRILOBA Raf., var. MOLLIS Raf. Aut. Bot. 85 (1840). *S. Sassafras* (L.) Karst. Pharm.-Med. Bot. 505 (1882). *S. variifolium* (Salisb.) Ktze. Rev. Gen. ii. 574 (1891). *Euosmus Sassafras* (L.) "Nutt." acc. to Jackson, Ind. Kew. ii. 914 (1893). *S. Laurus* Macloskie in Torreya, v. 198 (1905). *S. Sassafras officinale* (Nees & Eberm.) Clute in Am. Bot. xi. 72 (1906).

The application of Rafinesque's *Sassafras triloba*, var. *mollis* to the tree with soft-pubescent leaves is clear from his diagnosis: "fol. sepe integris villosis mollis, florib. laxis."

V. MEMORANDA ON ARUNCUS

ARUNCUS ALLEGHENIENSIS Rydb., var. **pubescens** (Rydb.) comb. nov. *A. pubescens* Rydb. N. Am. Fl. xxii³. 256 (1908). PLATE 416, FIG. 4.

The indigenous plants of eastern North America stand well apart from the Old World and western American representatives of *Aruncus*. The wide-ranging Eurasian *A. sylvester* Kostel. (1844) = *Spiraea Aruncus* L. (1753) and *A. Aruncus* (L.) Karst. (1882), has the brownish follicles (FIG. 3) 2.5–3 mm. long, with style (deciduous) 0.3–0.5 mm. long; seeds (FIG. 7) 2.2–2.6 mm. long, with empty tails one-third to one-half as long as the body, the surface coarsely reticulate. Its staminate flowers (FIG. 6) have the calyx-lobes broadly lanceolate, elongate and comparatively thin, displaying the evident midrib; and its leaflets (FIG. 13) are usually very thin, doubly sharp-serrate and long-caudate. The Alleghenian plant, *A. allegheniensis*, however, has the leaflets, although similar, tending to shorter-toothed margin and less elongate tip; but its fundamental differences are in the flower and fruit. The calyx-lobes (FIG. 5) are firm (drying dark), broader and more deltoid, without evident midrib; the olivaceous follicles (FIGS. 1 and 2) 1.5–2 mm. long, with style 0.5–0.8 mm. long; the seeds (FIG. 8) 1.5–2 mm. long, with much shorter or obsolete tails and finer reticulation.

So far as I can make out, *Aruncus pubescens* is an interior variety of *A. allegheniensis*, differing in its heavier and dull (rather than lustrous) foliage, a tendency to greater pubescence on the leaflets, and follicles slightly more slender and elongate (subcylindric and 1.7–2.5 mm. long, instead of semi-ovoid and 1.5–2 mm. long). Plants with the lower leaf-surfaces soft-pubescent occur in the Alleghenies: Allegheny Co., Pennsylvania (*Schafer*, no. 639), Washington, D. C. (*Steele et al.*), Baltimore, Maryland (*P. V. LeRoy*, 1867, ISOTYPE of *A. allegheniensis*), Pulaski Co., Virginia (*Small*) and Glasgow, Virginia (*E. B. Bartram*); but all other material seen by me from Virginia, West Virginia, North Carolina, Kentucky and Tennessee has the lower surfaces quite glabrous. In the more slender-fruited var. *pubescens* (Illinois and Iowa to Arkansas and Oklahoma) the leaflets may, likewise, be either very pubescent, as defined by Rydberg, or quite glabrous beneath: Mikanda, Illinois (*Gleason*), St. Louis, Missouri (*Sherff*, no. 235); and, by a fatality which often pursues those who are incautious in designating types, the MacDonald material from Peoria designated as the TYPE of *A. pubescens* (with leaves "rather copiously hairy beneath") displays no more pubescence than the LeRoy material from Baltimore (in both cases as represented in the Gray Herbarium) which seems to be an ISOTYPE of *A. allegheniensis* (separated from *A. pubescens* by

Photo. E. C. Ogden.

Pilea pumila, leaf-margins, × 1, seeds, × 20: fig. 1, from Vermont; fig. 2, from Maine; fig. 3, from Quebec; fig. 4, from Maine; fig. 5, from Prince Edward Island; figs. 6 and 7, from Maine; figs. 8 and 9, from Massachusetts.

P. pumila, var. Deamii: fig. 10, from Indiana (isotype); fig. 11, from Indiana; fig. 12, from Ohio; fig. 13, from Georgia; fig. 14, from Indiana; fig. 15, from New York.

P. fontana: fig. 16, from Indiana.

Photo E. C. Ogden.

Ranunculus flabellaris: fig. 1, fruiting branch, × 5/12; figs. 2 and 3, centers of flowers, × 4; fig. 4, achene, × 10.
R. flabellaris, forma riparius: rosette, × 5/12; stranded branch, × 5/12.

Photo. E. C. Ogden.

Ranunculus Purshii: fig. 5, flower, × 4; fig. 6, achene, × 10; figs. 7 and 8, flowering branches, × 5/12.

R. Purshii, var. prolificus: fig. 1, type of *R. multifidus*, var. *terrestris*, × 5/12; fig. 2, flower, × 4, from the latter; fig. 3, bud, × 4, from the latter; fig. 4, flower, × 4, from another Michigan station.

R. Purshii, forma terrestris: fig. 9, three plants, × 5/12.

Photo. E. C. Ogden.

Aruncus: fruits × 7; flowers and seeds × 10; leaf-tips × 1.

A. alleghenensis: fig. 1, over-ripe fruit from isotype, Baltimore, Maryland; fig. 2, fruits from Allegheny Co., Pennsylvania; fig. 5, flowers from District of Columbia; fig. 8, seeds from West Virginia.

A. allegheniensis, var. pubescens: fig. 4, fruits from Illinois.

A. sylvester: fig. 3, fruit from France; fig. 6, calyx from Hungary; fig. 7, seed from Austria; fig. 9, fruits from Oregon; fig. 10, flowers, showing obovate petals, from Salisburgia; fig. 11, flowers, with narrow petals, from Vancouver Island; fig. 12, tip o. leaflet, from British Columbia; fig. 13, tip of leaflet, from Czechoslovakia.

"leaflets . . . glabrous or nearly so beneath"). The really distinctive character of var. *pubescens*, centering on the Ozark Plateau, is that its follicles are more slender than in typical *A. allegheniensis* of the Appalachian Upland.

The wide-ranging plant of the Pacific slope, from northern California to Alaska, is separated by Rydberg as *Aruncus acuminatus* (Dougl.) Rydb. in N. Am. Fl. xxii^3. 255 (1908), the name coming from Douglas's manuscript *Spiraea acuminata*, which had been cited by Hooker in the synonymy of *S. Aruncus* (= *Aruncus sylvester*). This Pacific American plant has the large follicles (FIG. 9), seeds and calyces of the Eurasian *A. sylvester* (or *A. Aruncus*), but Rydberg stated their "specific" differences as follows:

Petals of the staminate flowers broadly rounded-obovate, about 4/5 as broad as long; leaflets lanceolate with long acumination . . . . 1. *A. acuminatus.*
Petals of the staminate flowers spatulate, 2/5–3/5 as broad as long; leaflets ovate, with shorter acumination. . . . . 2. *A. Aruncus.*

Unfortunately the difference in shape of petals relied upon by Rydberg can be quickly reversed, FIG. 11 showing flowers, × 10, from Vancouver Island (of *A. acuminatus*) with spatulate petals, FIG. 10, flowers from Salisburia with them much broader!

As to the acumination of the leaflets I see no difference; FIG. 13 is a tip of a leaflet of *A. sylvester* from Europe, FIG. 12 one of *A. acuminatus* from America. The calyx-lobes of the western American plant are also quite like those of the Eurasian (FIG. 6). So are the follicles (FIG. 9), the styles and the seeds. In other words, *Aruncus sylvester* of Eurasia occurs also in western North America; while in the ancient Ozark and Appalachian uplands a species with smaller and more olivaceous follicles, longer styles, smaller seeds and firmer calyx occurs. It is unfortunate that, in defining the latter, Rydberg ignored the significant calyx-lobes, styles and seeds and over-stressed the fickle characters of pubescence.

Several names of early date are cited by Rydberg as synonyms under *Aruncus*, in the North American Flora; consequently, by some who have not understood the situation, one of them, *A. vulgaris* Raf. Sylva Tell. 152 (1838), has been used on herbarium-labels. Under *Aruncus*, Rafinesque, in 1838, published two names: "Type *A. vulgaris* and *Americanus*." No diagnoses were given and no previous descriptions were cited; the two names of Rafinesque are absolute *nomina nuda* and have no further nomenclatural status. Rydberg cites, with

doubt, as synonyms of his *A. allegheniensis*, the three following: *Spiraea Aruncus*, β. *hermaphrodita* Michx. Fl. Bor.-Am. i. 294 (1803); *S. Aruncus*, β. *americana* Pers. Syn. ii. 46 (1806); and *S. americana* Steud. Nom. Bot. 805 (1821). These all rest on one type, Persoon merely having substituted β. *americana* for Michaux's name and Steudel (bunglingly) resting his *S. americana* on the same plant. Now, ARUNCUS DOES NOT HAVE THE FLOWERS HERMAPHRODITE and when Michaux got hold of a plant in the Alleghenies which looked like the European *Spiraea Aruncus* but differed "floribus . . . hermaphroditis-fertilibus" he called it var. *hermaphrodita*. *Astilbe biternata* (Vent.) Britton, of the *Saxifragaceae*, does have hermaphrodite flowers. It grows side-by-side with *Aruncus allegheniensis* and so completely mimics it that only by detailed examination of the flowers and fruits can the two be readily separated. *Spiraea Aruncus*, β. *hermaphrodita* of Michaux was, as to the defined characters, *Astilbe*. This was the judgment of Torrey & Gray, in 1840: "The variety with perfect flowers, first mentioned by Michaux, is probably Astilbe decandra (Tiarella biternata, *Vent.*), which in habit strikingly resembles this plant."—Torr. & Gr. Fl. N. Am. i. 417 (1840). If *Spiraea Aruncus*, β. *hermaphrodita* Michx. is *Astilbe*, then, automatically, *S. Aruncus*, β. *americana* Pers. and *S. americana* Steud. are likewise *Astilbe;* and perhaps *Aruncus americanus* Raf. may, by inference, be also associated with *Astilbe*. At least, Rydberg was quite justified in giving the Alleghenian species a new and properly defined name.

Very recently further confusion has been made by a Japanese botanist, Hara, who unjustifiably adopts Rafinesque's NOMEN NUDUM *Aruncus vulgaris* to displace *A. sylvester* and then coins for the Alleghenian plant the unfortunate combination *A. vulgaris*, var. *americanus* (Pers.) Hara, Bot. Mag. (Tokyo), xlix. 115 (1935), entirely ignoring the fact that Persoon's *Spiraea Aruncus*, var. *americana* and all names dependent upon it are substitutes for *S. Aruncus*, β. *hermaphrodita* Michx., which is *Astilbe* of the *Saxifragaceae*.

(*To be continued*)

THREE JUNIPERS OF WESTERN TEXAS

V. L. CORY

A CONFUSION or misconception of certain species of North American junipers has long existed. For our purpose it suffices to go back only

as far as the acceptance by Engelmann of a species of the states of the Pacific Coast, *Juniperus occidentalis* Hooker, as occurring in Texas. The species to which he referred is known now as *J. mexicana* Spreng. In addition to this Engelmann described and named two varieties of *J. occidentalis* as occurring in Texas, namely vars. *conjugens* and *monosperma*. The first of these does not appear to be a good variety. As to the second of these it appears that Engelmann included more than one thing in the conception of his variety *monosperma*. In the first place this variety was distinguished from the species by having smaller bluish-black fruits with one or more less grooved seed. Had he stopped here it is granted that he would have indicated a good variety of the species which he was considering to be *J. occidentalis*, but not of that species as now known. However, he goes on to state: "In Colorado the berries are often copper-colored, as Parlatore describes those of the species (*J. occidentalis*) and in some trees the seeds protrude." The parentheses are the writer's, while the quotation is from Trans. St. Louis Acad. Sci. **3**: 590. 1877. It does seem that the quoted part of his description refers to something entirely different from the preceding portion of the same.

Considering first that part of Engelmann's description of his variety *monosperma* referring to its characterization by having smaller bluish-black berries with one or more less grooved seed, Sargent in 1889 recognized such a juniper as distinct from *J. occidentalis* and raised it to specific rank. Study of herbarium material, accepted by the Arnold Arboretum as authentic for both *J. mexicana* and *J. monosperma*, in fruit, seed, and other characters convinces the writer that the differences are insufficient for maintenance of the latter as a distinct species. It is his opinion that the latter should be recognized as a geographical variety of the former, its occurrence apparently being largely, if not entirely, north of the occurrence of the typical form of the species, and that it should be known as

Juniperus mexicana Spreng., var. **monosperma** (Engelm.), new comb. *J. occidentalis*, β. *monosperma* Engelm. Trans. St. Louis Acad. **3**: 590 (1877).

Now considering that part of the description previously quoted, it seems to the writer that this refers to the juniper that was described by Lemmon in 1895 as variety *gymnocarpa* of Hooker's *J. occidentalis*. In 1915 Wooton and Standley refer to this particular juniper on page 58 of "Flora of New Mexico," and make the following statements:

"What is probably a form of *J. monosperma*, or possibly a distinct species, was described by Lemmon as *Juniperus occidentalis gymnocarpa.* It is said to have the solitary seed partly exposed at the apex, hence the name. Mr. Lemmon states that this form is 'abundant on the Sandia Mountains, near Albuquerque,' New Mexico. No specimens have been seen by the writers. The same form has been collected near Fort Huachuca, Arizona, by Gen. T. E. Wilcox." Field experience together with study of herbarium material convinces this writer that Lemmon's variety is a good species, and that it should be recognized as such by the name

Juniperus **gymnocarpa** (Lemmon), new comb. *J. occidentalis*, var. *gymnocarpa* Lemmon, West Am. Cone-Bearers, 80 (1895).

Juniperus gymnocarpa is clearly distinct from all other junipers in the mountains of southwestern Texas, while in fully mature fruit it is obviously distinct from all other described junipers. In southwestern Texas this species is a tree with a stout trunk, not branched for some distance above the ground, the branches spreading, relatively not stout, and forming an irregular head with dense foliage. The mature fruit is reddish-brown in color, but noticeably smaller than the fruits of other junipers of Texas having similar color in the mature fruit. The characteristic feature of the mature fruit, which marks it as a distinct species, is that the solitary seed, which is large for the cone containing it, is exposed at the tip for as much as one-fourth or more of the length of the seed. At maturity the fruits are broader than long, whereas preceding maturity they are not. Well-developed, fully mature fruits are about 5 mm. broad and 4 mm. high, with the exposed portion of the seed measuring as much as 1 mm., or slightly more, in height. The top of the cone consists of a thickened ring, with the diameter of the opening varying largely with the maturity of the fruit, with immature fruit, even when copper-colored, having no opening whatsoever, and mature fruit with an opening 2–3 mm. in diameter, the opening being somewhat ellipsoidal. As a concrete example, the following details are taken from one of the smaller, but fully mature fruits. The fruit is 3.5 mm. broad and 3 mm. high, with the exposed end of the seed projecting a full millimeter beyond, and with the opening of the apical cone-ring 2.5 mm. in diameter. The seed is pyriform, the basal part smooth and rounded, almost hemispherical, and above the basal part it is 2-winged, the wings gradually widening above, extending only to the edge of the exposed portion of the

seed, there truncate and supporting the apical ring of the cone. The seed is 4 mm. high, 2.7 mm. broad at its major diameter, and 1.5 mm. broad at the base of its exposed portion. The included portion of the seed is light-colored, while the exposed portion is dark-colored, dome-shaped, and with the center marked by a low, circular, blunt crateriform point 0.3 mm. in diameter, noticeably darker colored than its immediate surroundings.

This species of the mountain valleys of southwestern Texas apparently has a distribution westward through New Mexico to Arizona and north therefrom to southern Utah, Nevada, and Colorado, and possibly southward into Mexico. In Texas it grows only in the mountains, and there only in the higher valleys or on the mesa-like tops of the mountains of lower elevations. Its zone of occurrence is above that for *J. Pinchoti* and below that of *J. erythrocarpa*, and more or less coextensive with the zones of *J. pachyphloea* and *J. flaccida*, both of which species may be found at lower elevations than *J. gymnocarpa*.

Representative material deposited in the herbaria of the Arnold Arboretum and the Missouri Botanical Garden comes from a tree ten miles up Frazier Canyon from State Highway No. 17 in Limpia Canyon of the Davis Mountains, and was collected November 3, 1934.

The failure heretofore to recognize this juniper as a distinct species is quite probably due to the fact that the immature fruit, even after assuming the reddish-brown coloration, does not exhibit the characteristic exposure of the end of the seed. Because the fruit is strictly 1-seeded and, also, because it evidently was included by Engelmann in his variety *monosperma*, this species, in the absence until the present of special study devoted to it, has been considered heretofore either as *J. monosperma* itself or as a variety thereof. The present study is convincing that it is distinct.

While *J. gymnocarpa* long has been known in a more or less general way, another 1-seeded juniper, now shown to be distinct, if known at all was accepted likewise as being either *J. monosperma* itself or a form thereof. The writer first noted this species on August 27, 1927, on top of the Davis Mountains at a point about eight miles northwest of Alpine and about two miles directly south of Mitre Peak. Its mature bright-red, fleshy, 1-seeded fruits at once set it apart from the other species of junipers growing in these and other mountains of

southwestern Texas. However, it was more than six years later before further opportunity for study of this species was afforded. It was then that a special trip covering a thousand miles was rewarded by finding this juniper in mature fruit and in some abundance on the top of the Chisos Mountains, at least 85 miles on an airline south and east of the previous station. Material collected here on December 2, 1933, from the trees bordering the laguna at the west base of the peak of Mt. Emory is used for describing the new species.

Juniperus **erythrocarpa**, sp. nov. Arbor parvus plerumque minus quam 5 m. altus, ramis adscendentipatentibus; fructibus maturis globosis diametro 6–8 mm. plerumque circa 8 mm. rubris carnosis monospermis; semine pyriformi circa 5 mm. longo 4 mm. lato, pallido, supra basin laevem rotundatumque prominenter bicarinato, vitta fusca dimidiam partem superficiei tegente, in parte superiore faciei utraeque foveis tribus ellipticis 1 mm. vel ultra longis et ad fines vittae 1 vel 2 foveis duplo majoribus ornato.

A small tree, mostly under 5 m. in height, with branches ascending-spreading and forming an open, irregular head; mature fruits globose, 6–8 mm. in diameter, mostly near 8 mm., bright-red, fleshy, 1-seeded; seed pyriform, relatively broad, approximately 5 mm. long by 4 mm. broad, light-colored, above the smooth and rounded base prominently 2-ridged and marked by a dark-colored ridge-band, which covers as much as one-half or more of the surface of the seed, and further marked by 3 concavities, 1 mm. or more long and half as wide, on the upper part of each of the two faces, and either 1 or 2 concavities, about twice as large at each end of the ridge-band.

Representative material of this collection, from West base of peak of Mt. Emory, December 2, 1933, no. 7642 (type in Herb. Arnold Arboretum) is deposited in the herbaria of the Arnold Arboretum and the Missouri Botanical Garden.

Juniperus erythrocarpa is a small tree growing at the higher elevations in the mountains of southwestern Texas, and it should occur also across the Rio Grande in the mountains of Mexico. In Texas this juniper is unique in the striking coloration of its mature fruits and in the strong markings of its seeds. A seed 5 mm. long and 4 mm. broad at its major diameter has a smooth, hemispherical, light-colored base, with the rounded ends of the dark-colored ridge-band beginning at slightly more than 1 mm. above the center of the base on opposite sides, here being 3 mm. broad, but broadening as they rise into an arch which covers the apical end of the seed. On both sides the ridge begins just above the end of the ridge-band and is continuous across the obtuse apical end of the seed, which is flattened in one plane and

acute in a plane at right angles thereto, and not at all dome-shaped, as in *J. gymnocarpa.* At the center of the apex of the seed, or slightly to one side of the center, the ridge bears a darker-colored circular point, which is approximately 0.25 mm. broad and almost as high. The dark-colored ridge-band covers from about one-half to as much as three-fourths of the surface of the seed, the relatively longer seeds being less rounded at the base and having more of their surface covered by the dark-colored band. The concavities are oblong, rounded, shallow depressions regularly and uniformly arranged on opposite sides of the seed. Each face has 3 similar concavities on its upper portion, all 3 situated partly in the light-colored area and partly in the dark-colored area, except that in the longer and narrower seeds one of these concavities lies wholly within the dark-colored area. Likewise at each end of the dark-colored ridge-band are situated 1 or 2 concavities, about 2 mm. long and 1 mm. broad, and slightly deeper than the upper concavities. In the relatively broad seed there is usually one such concavity, and this lies partly in the light-colored area and partly in the ridge-band area, the ridge itself beginning in the concavity, whereas in the longer and narrower seed there are usually 2 concavities at each end of the ridge-band, and situated wholly within its area, being narrowly separated by the ridge, the angle of which is markedly accentuated by the proximity and depth of the two concavities.

Grateful acknowledgement is made for the courteous and valued assistance of Mr. Ernest J. Palmer of the Arnold Arboretum given from time to time while these studies were in progress, and also to Dr. Julian A. Steyermark of the Missouri Botanical Garden for helpful suggestions concerning the manuscript.

Texas Agricultural Experiment Station,
Sonora, Texas.

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XIV

Norman C. Fassett

Vicia Cracca and its Relatives in North America. The range of *Vicia Cracca,* as usually described, includes most of the Middle

West. Nearly all the material the writer has seen[1] from the states of Minnesota, Wisconsin, Iowa, Illinois, and Indiana, identified as *V. Cracca*, belongs to other species. The range of *V. Cracca* in North America appears to be as follows: Greenland; James Bay; Newfoundland to Delaware, west to southeastern Michigan and western Ontario; northeastern Wisconsin; southern Alberta to Washington.

Most frequently mistaken for *V. Cracca* is *V. villosa*, which largely replaces it in the Middle West. The floral differences between these

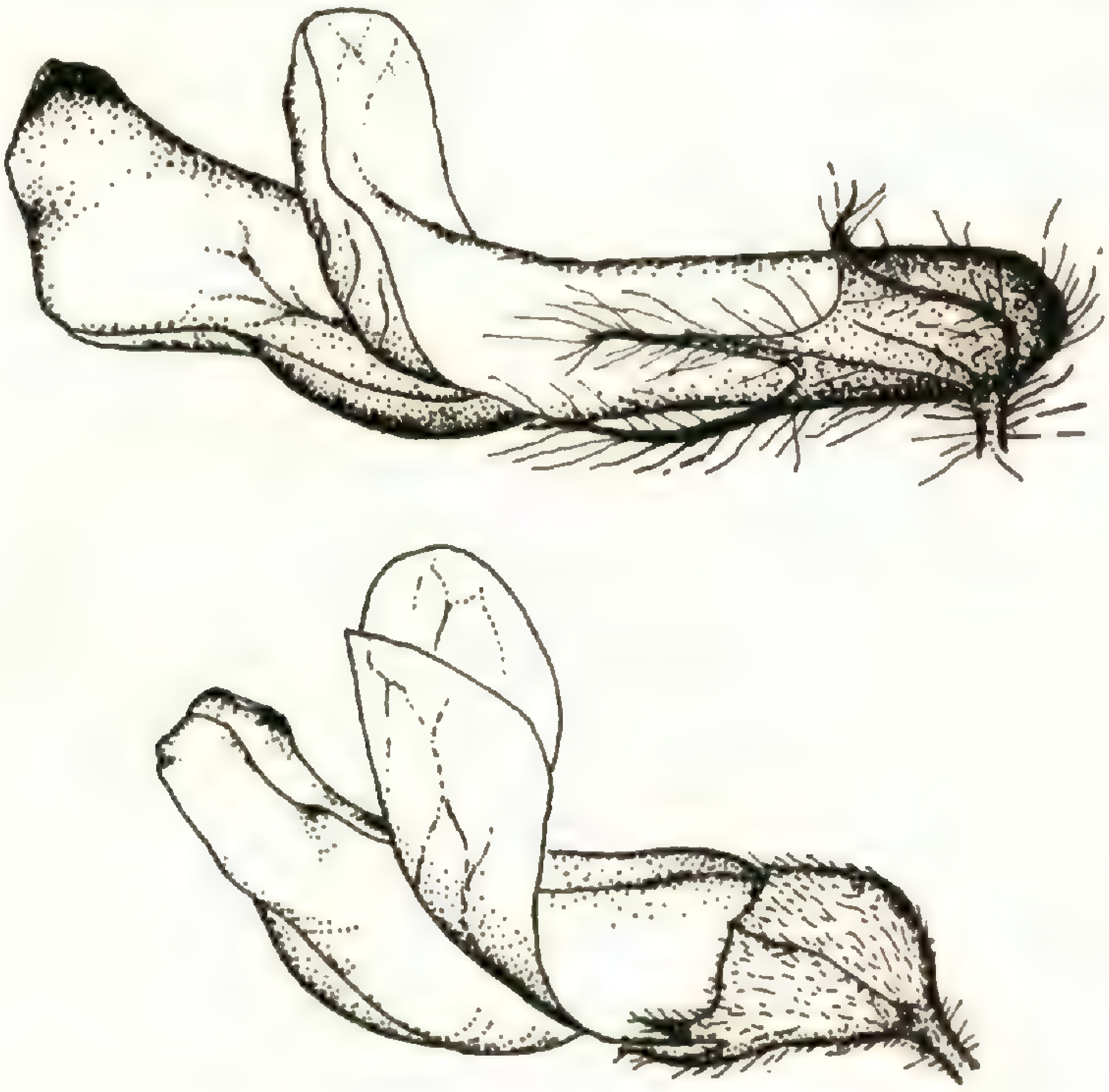

Fig. 1. Flower of Vicia villosa (above) and of V. Cracca (below), × 5.

two species are shown in the drawings by Dr. R. I. Evans. *V. villosa* ranges from Maine to South Carolina and Mississippi, westward to California and British Columbia. There is some variation in flower size and in pubescence.

A species not previously recorded from North America is *V. dasycarpa*. Specimens have been seen from Maine, New York, Pennsylvania, New Jersey, Delaware, Virginia, North Carolina, Georgia, Michigan, Montana, and California. All the collections were made

[1] Including collections in the Gray Herbarium, the Britton Herbarium of the New York Botanical Garden, the Academy of Natural Sciences of Philadelphia, the Field Museum of Chicago, the University of Minnesota, the University of Wisconsin, the University of Michigan, Michigan State College, Iowa State College, the Milwaukee Public Museum, and the Herbarium of Mr. C. C. Deam.

within the last two decades, except two. These were both on ballast: Communipaw Ferry, New Jersey, July 7, 1879, and Greenwich Point, Philadelphia, Pennsylvania, May 18, 1898.

A fourth species in this group is *V. tenuifolia,* which is established in the University Orchard at Madison, Wisconsin.

These four species may be distinguished as follows:

a. Flower less than 4 times as long as broad; limb of standard at least as long as the claw; calyx not gibbous at base, its lobes long-triangular, 1–2.5 mm. long. . . .*b.*
b. Limb of standard about equalling the claw; raceme not usually more than 1½ times as long as its subtending leaf. . . .*c.*
c. Leaflets glabrous to dull-pilose above; stem appressed-pubescent. . . .*d.*
d. Corolla purplish or blue. . . . . *V. Cracca* L.
d. Corolla white. . . . . *V. Cracca* f. *albida* (Peterm.) Gams.
c. Leaflets silvery-silky above; stem tomentose *V. Cracca* f. *sericea* (Peterm.) Beck v. Man.
b. Limb of standard longer than the claw; raceme about twice as long as the subtending leaf. . . . . *V. tenuifolia* Roth.
a. Flower at least 5 times as long as broad; limb of standard less than ½ as long as the claw; calyx strongly gibbous at base above the attachment of the pedicel, its lobes almost thread-like. . . .*e.*
e. Plant more or less appressed-pubescent or nearly glabrous; lowest lobe of calyx 1–2 mm. long. . . . . *V. dasycarpa* Ten.
e. Plant with long spreading white hairs; lowest lobe of calyx 2–4 mm. long. . . .*f.*
f. Corolla purple to blue. . . . . *V. villosa* Roth.
f. Corolla white. . . . . *V. villosa* f. *albiflora* (Schur) Gams.

SOME FORMS OF DESMODIUM. The three species, *Desmodium acuminatum, D. nudiflorum,* and *D. pauciflorum,* are ordinarily so easily distinguished on a basis of the distribution of the leaves that this is largely relied upon in most keys. The result is that an occasional specimen with distribution of foliage unusual for the species is nearly always misidentified. A not uncommon form of *D. nudiflorum*[1] with scattered leaves on the flowering stems is often misdetermined as *D. pauciflorum.* A similar form of *D. acuminatum*[2] sometimes causes confusion. *D. nudiflorum* rarely has leaves clustered on the flowering stem as in *D. acuminatum.*[3]

[1] D. NUDIFLORUM f. **foliolatum** (Farwell) n. comb. *Meibomia nudiflora foliolata* Farwell, Papers Mich. Acad. Sci. i. 95 (1923).

[2] D. ACUMINATUM f. **Chandonnetii** (Lunell) n. comb. *Meibomia grandiflora Chandonnetii* Lunell, Am. Midland Nat. ii. 128 (1911).

[3] D. NUDIFLORUM f. **personatum,** n. f., caulis cum floribus et cum foliis subverticillatis.—Pastured wooded hillside, Gassner Hollow, Wyalusing, Wisconsin, August 14, 1934, *Fassett,* no. 16735 (TYPE in the Herbarium of the University of Wisconsin).

There seems to be but one color form recorded in this group, a white-flowered *D. nudiflorum*.[1]

There are, of course, adequate floral and vegetative characters besides those too often relied upon in the separation of these three species. The following key should be of use in placing all forms.

a. Flowers 6–8 mm. long; remains of stamen-tube at base of fruit 6–8 mm. long; stipe of fruit glabrous or minutely granular. . . . *b.*
b. Pedicels 5–8 mm. long in fruit; terminal leaflet about as long as broad, with a tapering point 1–2.5 cm. long, light green beneath, with white spreading or appressed hairs on both surfaces; stipules (3–)6–10 mm. long. . . . *c.*
c. Leaves clustered about midway on the flowering stem. *D. acuminatum* (Michx.) DC.
c. Leaves more or less scattered on the flowering stem. *D. acuminatum* f. *Chandonnetii* (Lunell) Fassett.
b. Pedicels filiform, 1–2 cm. long in fruit; terminal leaflet nearly or quite 1.5 times as long as broad, abruptly pointed or with a tapering tip 0.5 cm. long, whitened beneath and mostly glabrous except on the veins, above with almost microscopic glandular hairs as well as a few scattered larger white hairs; stipules 1.5–3.5 mm. long. . . . *d.*
d. Flowers violet. . . . *e.*
e. Flowering stem naked. . . . . *D. nudiflorum* (L.) DC.
e. Flowering stem with leaves. . . . *f.*
f. Leaves scattered on flowering stem. *D. nudiflorum* f. *foliolatum* (Farwell) Fassett.
f. Leaves subverticillate on flowering stem. *D. nudiflorum* f. *personatum* Fassett.
d. Flowers white. . . . . *D. nudiflorum* f. *Dudleyi* (House) Fassett.
a. Flowers 3–6 mm. long, white; remains of stamen-tube at base of fruit 2.5–3 mm. long; stipe of fruit with minute hooked hairs; pedicels less than 1 cm. long in fruit; terminal leaflet about 1.5 times as long as broad, with scattered white appressed hairs above and below, whitened beneath. *D. pauciflorum* (Nutt.) DC.

Amorpha fruticosa L., var. angustifolia Pursh, f. **latior**, n. f., foliolis 2–5 cm. longis 1–2 cm. latis.—Stony shore of Lake St. Croix, 10 miles south of Hudson, Wisconsin, August 2, 1934, *Fassett*, no. 17014 (type in Herbarium of the University of Wisconsin).

A. fruticosa var. *vulgaris* Pursh (typical *A. fruticosa*) is fairly constant in the proportions of the leaflets, which are about twice as long as broad, while the more western var. *angustifolia*, which was originally defined as a shrub with narrow leaflet,[2] may have them

[1] D. nudiflorum f. **Dudleyi** (House) n. comb. *Meibomia nudiflora* f. *Dudleyi* House, Bull. N. Y. State Mus. ccxliii–ccxliv. 52 (1923).

[2] Schneider, Bot. Gaz. xliii. 303 (1907), expresses doubt as to the identity of Pursh's plant. An examination of this specimen, at the Academy of Natural Sciences of Philadelphia, shows it to be identical with the plant with narrow leaflets here treated as var. *angustifolia*.

either very narrow or as broad as in var. *vulgaris.* The most reliable distinction between the two varieties seems to be in the nature of the pubescense of the lower side of the midrib of the leaflets, which is closely appressed in var. *angustifolia* and spreading in var. *vulgaris.* (The amount of pubescence is variable in each). Var. *vulgaris,* while constant in proportions of leaflets and type of pubescence, may have the base of the leaflets either cuneate or rounded. Var. *angustifolia* is constant in having appressed pubescence and cuneate leaflet-bases, but is variable in width of leaflets. Var. *angustifolia* occurs from Wisconsin to Texas, northwestward to southern Saskatchewan, westward to Colorado and southward to northern Chihuahua. Var. *vulgaris,* as here defined, is more eastern, ranging westward to northern Illinois and southern Arkansas. All specimens from Minnesota, Wisconsin, Iowa, Kansas, and Missouri, identified as typical *A. fruticosa,* appear rather to be var. *angustifolia* f. *latior.*

Amorpha canescens Pursh, f. **glabrata** (Gray) n. comb. *A. canescens* var. *glabrata* Gray, Pl. Wright. i. 49 (1852).

Plants with the leaflets nearly glabrous or with sparse crinkled hairs are of frequent occurrence throughout the range of *A. canescens* in Wisconsin; these often, but not always, have the short rounded leaflets described by Schneider.[1] Leaves which are extreme both in lack of pubescence and in oval shape of leaflets may be found on stems attached to rootstocks which bear also stems with foliage normal for the species.

Madison, Wisconsin.

NOTES ON THE FLORA OF COLUMBIA, MISSOURI, III.

Francis Drouet

The following additional changes in the knowledge of the flora of Columbia, Missouri, are based upon recent collections and upon material in the Herbarium of the University of Missouri upon which the Floras of Columbia by Dr. Francis Daniels (Univ. Mo. Stud. **1**(2). 1907) and by Dr. H. W. Rickett (Univ. Mo. Stud. **6**(1). 1931) were founded. Similar notes have appeared in Rhodora **35**: 359–364, **36**: 415–417, and **37**: 189–196. Dr. J. A. Steyermark and Mr. B. F. Bush have examined most of the specimens and have cooperated in many

[1] L. c. 300

other ways. Dr. K. M. Wiegand has seen and annotated the sheets of Echinochloa and Aster; Dr. E. E. Watson those of Helianthus; and Dr. H. A. Gleason and Mr. G. W. Bohn those of Vernonia concerned. The writer, however, assumed full responsibility for the data listed below. The names preceded by an asterisk (*) indicate species which have not previously been reported or collected in the Columbia region.

Echinochloa muricata (Michx.) Fernald, Rhodora **17**: 106. 1915. *E. Crus-Galli* of the Columbia Floras. A few specimens are annotated by Dr. Wiegand as intermediate between the typical variety and the var. *microstachya* Wieg.

*Echinochloa muricata var. occidentalis Wiegand, Rhodora **23**: 58. 1921. Two specimens from the bottoms of Hinkson Creek: "Old Waterworks," *Jeffrey*, July 24, 1933; "8 miles north of Columbia," *Jeffrey 377*, Oct. 21, 1933.

Festuca octoflora Walt. var. tenella (Willd.) Fernald, Rhodora **34**: 209. 1932. Additional material collected on the sandstone outcrops north of Claysville, *Drouet 1370*, Apr. 29, 1934.

Trillium Gleasoni Fernald, Rhodora **34**: 21. 1932. See also Rhodora **36**: 121–128. 1934. *T. declinatum* (Gray) Gleason. *T. erectum* of the Columbia Floras.

Celtis laevigata Willd. var. texana (Scheele) Sarg. *C. laevigata* of the 1931 Flora, in part.

Polygonum ramosissimum Michx. *P. tenue* of Drouet, Rhodora **37**: 191. 1935.

Ranunculus septentrionalis Poir. Includes *R. hispidus* of the Columbia Floras.

Arabis virginica (L.) Trel. *Cardamine pennsylvanica* of the Columbia Floras.

*Linum sulcatum Riddell. County Road Prairie, Callaway Co.: *Jeffrey & Drouet 823*, July 30, 1933; *Drouet 1669*, Aug. 15, 1934.

Helianthemum Bicknellii Fernald, Rhodora **21**: 36. 1919. *H. majus* of the Columbia Floras, not BSP. Daniels (Flora, p. 177) says of this, "scarce on high bluffs." His single specimen "High bluffs, Columbia," July 1903, bears the annotation "Scarce!" The species had apparently not been recognized in the region since Daniels, until the summer of 1933. Two recent collections are "Barren cliff above Hinkson Creek east of Lover's Leap," *Drouet 889*, Aug. 5, 1933, and "County Road Prairie," Callaway Co., *Drouet 1671*, Aug. 15, 1934.

Steironema lanceolatum (Walt.) Gray. Including *S. radicans* of the 1931 Flora, p. 59. The leaves and calyces of the fragmentary specimen cited as *S. radicans* ("Horseshoe Lake," *Daniels*, Aug. 1897) are quite similar to those of other specimens of *S. lanceolatum* in the collection. The var. *hybridum* of Rickett's Flora and *S. hybridum* of Daniels are based upon portions of inflorescences of large plants

("Swamp south," *Daniels*, Aug. 1904, and "Horseshoe Lake," *Daniels*, Aug. 1897) with long, narrow upper leaves. Further collections and field observations will be necessary to establish whether or not such specimens are luxuriant forms of the typical variety produced under exceptionally favorable environmental conditions.

Apocynum androsaemifolium L. Including the var. *incanum* of the 1931 Flora. Only two collections are known to me, these from south of Columbia: "Fields south," *Daniels*, July 1903; "Pasture and fields by Black's Mill Road east of Tinspout Spring," *Drouet 1692*, Aug. 26, 1934.

Boltonia latisquama Gray. Collected recently as a waif in the University Orchard, *W. Bohn 403*, Sept. 26, 1934.

Chrysanthemum leucanthemum L. var. pinnatifidum Lecoq & Lamotte. Including *C. Leucanthemum* of the Floras.

All of the Columbia specimens have pinnatifid basal and cauline leaves, and there is surely no other morphological basis for distinguishing two varieties among them.

Vernonia altissima Nutt. Including *V. chrysopappa* Daniels and *V. fasciculata* of the 1931 Flora.

In the genera Aster and Helianthus, where an entirely new arrangement of specimens has been found necessary and where the greater number of sheets of Columbia plants has been added since the publication of the Floras, it seems advisable to present a list of species and varieties as now recognized and to omit synonymy of earlier lists. The 192 sheets of Aster from the Columbia region have been distributed into the following categories, if we omit those few which are at present interpreted as "hybrids" between "typical" forms.

Aster anomalus Engelm.

Aster cordifolius L.

I can find no morphological basis among the Columbia material for separating a var. *polycephalus* Porter as distinct from the typical variety.

Aster Drummondii Lindl.

Aster ericoides L. var. prostratus (Kuntze) Blake, Rhodora **32**: 138. 1930. *A. multiflorus* Ait. and var. *exiguus* Fernald, in part.

The typical variety undoubtedly occurs here, but no specimen of it is found in the present Columbia collection.

Aster interior Wiegand, Rhodora **35**: 35. 1933. Two collections are doubtfully referred here: "Boone Co.," *Favor*, Sept. 23, 1901; "Low ground along railroad ½ mile north of Browns Station," *Drouet 1168*, Sept. 16, 1933.

The specimens resemble closely those of *A. paniculatus* var. *simplex*

but have smaller heads. It would seem more satisfactory at present to treat these specimens as "hybrids."

Aster lateriflorus (L.) Britton var. pendulus (Ait.) Gray. *A. lateriflorus* of Gray's Manual, ed. 7, in part. See Rhodora **30**: 173. 1928.

Aster novae-angliae L.

Aster oblongifolius Nutt. var. rigidulus Gray. *A. Kumleini* Fries.

Aster paniculatus Lam. var. simplex (Willd.) Burgess. See Rhodora **35**: 32. 1933. One specimen, "Moist places, Columbia," *Daniels*, Sept. 26, 1902, with narrow leaves and open habit approaches the typical variety. This specimen is obviously the basis of the var. *bellidiflorus* of the Columbia Floras.

*Aster pantotrichus Blake, Journ. Wash. Acad. Sci. **21**: 327. 1931. *A. missouriensis* Britton.

Often encountered, and always raising in one's mind the suspicion that it might be an ecological form of *A. lateriflorus* var. *pendulus*.

Aster parviceps (Burgess) Mack. & Bush. *A. depauperatus* (Porter) Fernald var. *parviceps* (Burgess) Fernald. See Rhodora **11**: 59. 1909. Common in old fields, etc.

Aster patens Ait.

Aster pilosus Willd. *A. ericoides* of Gray's Manual, ed. 7, sens. ampl., not L.

Specimens from central Missouri appear to represent every gradation between any two of the three extremes: var. *demotus* Blake, var. *playtphyllus* (T. & G.) Blake, and the typical variety. See Rhodora **32**: 139. 1930.

Aster praealtus Poir. *A. salicifolius* of Gray's Manual, ed. 7, in part, not Lam.?

Aster sagittifolius Wedemeyer.

Aster turbinellus Lindl.

The 107 sheets of Helianthus from Columbia have been checked over by Dr. Watson and myself according to his recent revision (Papers Mich. Acad. Sci. **9**: 305–475. 1929). They appear to fall in the following grouping.

Helianthus rigidus (Cass.) Desf. (*H. scaberrimus* Ell.), H. annuus L., H. mollis Lam., H. tomentosus Michx., H. leptocaulis (S. Wats.) Blake, H. hirsutus Raf., H. grosse-serratus Martens, *H. severus E. E. Wats., H. tuberosus L., H. tuberosus var. subcanescens Gray, H. membranaceus E. E. Wats., H. formosus E. E. Wats., H. leoninus E. E. Wats., and H. strumosus L.

It would seem more proper at present to consider the specimens disposed under *H. tomentosus* and *H. leptocaulis* as ecological variations

or divergent races of *H. hirsutus,* since the morphological characters separating the three groups are so variable. One is often led to suspect that his final decision as to the identity of a specimen has been influenced overmuch by personal inclination or chance. One receives a similar impression with the specimens in the group *H. strumosus, H. formosus,* and *H. leoninus.*

DEPARTMENT OF BOTANY,
UNIVERSITY OF MISSOURI.

A FURTHER NOTE ON SOLIDAGO RIGIDA L.[1] The late K. K. Mackenzie and I had many arguments on points of nomenclature, particularly on methods of typifying old species. A few of them got published; more remain in the files of a correspondence probably as acrimonious as any which ever took place and still left the participants personally friendly. He and I were somewhat like the professional soldiers of the eighteenth century—hostile enough at the moment of battle, but afterward disposed to accept one another as brothers in our craft. On the rather rare occasions when I did something of which he could approve, he was generous in his commendation; and I am indebted to him for several notable kindnesses. It seems almost like taking a mean advantage to continue an argument now that he cannot reply; I shall rather miss the pungent rejoinder he would have been sure to make.

But the primary object of this note and of a few which may follow it is not to prove Mackenzie wrong, but to complete the record. Whether one takes his point of view or mine, it should be of advantage to have all the evidence at hand. And one part of it—the specimens which lie back of the Linnean citations—has not, in this instance, hitherto been investigated. Therefore, when a visit to Europe in 1935 gave me the opportunity, I attempted to find and examine such of them as are still in existence.

It will be recalled that Linnaeus based *Solidago rigida* wholly on two references, one to Hortus Cliffortianus and one to a plate in Hermann's Paradisus Batavus. The specimen in the Clifford herbarium and a duplicate in the herbarium of Linnaeus himself have long been known and are *S. rigida* in the traditional sense. The issues between Mr. Mackenzie and me were two: first, whether these speci-

[1] See RHODORA, xxviii. 29 and 138 (1926); xxix. 26 (1927).

mens or the plate of Hermann should be taken as typifying the species; second, if the latter, whether or not he was correct in interpreting it as *S. patula.* It was to settle the latter point that I endeavored to find specimens which should represent Hermann's conception.

No specimens illustrating the Paradisus exist at Leyden or are known to exist elsewhere. Probably the nearest approach to anything authentic is a specimen in the Sloane herbarium at the British Museum. This is in the Bonivart collection (vol. 84), said by Sloane to have come "most of the garden of Leyden from Dr. Hermann, etc." Its label bears a reference to the Paradisus and a phrase-name which seems to be made up of excerpts from the various citations given by Linnaeus in the Hortus Cliffortianus: "Virga aurea Americana s. Noveboracensis Doria similis late rigidoque folio. Par. Bat. Pr." The specimen is *S. rigida* in the traditional sense. So are an old specimen from the Paris garden[1] and two from the Chelsea garden, all bearing Hermann's phrase-name. I could find no specimens of any other species with this name attached.

The evidence from specimens, then, is of a rather negative character. There is no actual assurance that the Bonivart plant came from Leyden, though, since most of his material did, there is a fairly strong probability; and no connection between the others and Hermann can be traced. One thing, however, seems clear. During the period between the publication of the Paradisus and the Species Plantarum, Hermann's phrase-name was widely, if not universally, applied in the botanic gardens of the time to the plant which has ever since passed as *Solidago rigida;* and there is no evidence that it was ever applied to anything else. Mr. Mackenzie's case rests wholly on his own (to me, dubious) interpretation of the Hermann plate. The interpretation of Hermann's contemporaries, as well as of unanimous usage since, is against him. And the acceptance of the Clifford specimen, which Linnaeus saw, as the type of the species, seems more reasonable than ever.—C. A. Weatherby, Gray Herbarium.

[1] Which might possibly represent the plant back of the passage from Tournefort cited in the Hortus Cliffortianus. For full quotation of these references see Rhodora, xxviii. 30–31.

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MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

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No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

Rhodora

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BRAUNERIA ATRORUBENS AND B. PARADOXA

Ernest J. Palmer

While looking over a collection of plants made by Mr. George M. Merrill in the Platt National Park, Murray County, Oklahoma, I came across several specimens of a *Brauneria* which I did not at once recognize. Upon consulting the second edition of Small's Flora of the Southeastern United States they proved to be *Brauneria atrorubens* (Nutt.) Boynton & Beadle,[1] as treated in that work. The Oklahoma plants looked surprisingly like *Brauneria paradoxa*, of the Ozark glades, except for the color of the rays, which was purple or purplish-pink, while that of the Ozark plant wherever I have seen it has been a deep clear yellow. In Small's description it is stated that the rays of *Brauneria atrorubens* are either purple or yellow, and the range is given as Missouri and Arkansas. Since there is no other species in that region that would at all answer the description, it seems evident that it was the intention of the author to include *Brauneria paradoxa* under the older name and to broaden the description to cover both, although no synonymy is given.

The identity of Nuttall's plant, presumably collected on his journey to the Arkansas Territory in 1819, and which he first described as *Rudbeckia atrorubens*,[2] and afterwards transferred to the genus *Echinacea*,[3] was later confused by the treatment in Gray's Synoptical Flora and in Chapman's Flora of the Southern United States, as pointed out by Boynton and Beadle.

[1] Biltmore Bot. Studies **1**: 11–12. 1901.
[2] Journ. Acad. Nat. Sci. Phila. **7**: 80. 1834.
[3] Trans. Am. Phil. Soc. n. s. **7**: 354. 1841.

My interest in working out the identity of the Oklahoma plants and their relationship to the yellow-rayed plant of the Ozarks led me to write to the Academy of Natural Sciences of Philadelphia, where Nuttall's type specimen is deposited, and through the kindness of Dr. Pennell, the curator, I was able to borrow it for examination.

In its present condition the Nuttall specimen consists of a stem about 7 dm. high, with part of the fusiform root, several leaves, and the head, of which only the involucre and disk remain, the rays being entirely gone. The stem is striate and glabrous except near the summit where it is roughened with short scabrous ciliae. The leaves are lanceolate or linear-lanceolate, 3-ribbed, glabrous, except for ciliate margins, with blades 6–8 cm. long and scarcely 1 cm. wide, and slender petioles 4–5 cm. long on the basal ones, and shorter above.

The plants collected by Mr. Merrill, numbers 327 (May 7), 443 (May 17), and 819 (July 2), 1935, match very closely the Nuttall plant, except that some of them are more robust, the tallest being 8 dm. high, and the leaves slightly larger and sometimes scabrate on the lower surface. Some of the basal leaves have blades 10–12 cm. long and petioles almost as long. The greatest width of the blades of the middle stem leaves is about 14 mm., and there is sometimes a slight development of a second pair of lateral veins on these.

Brauneria paradoxa as shown by specimens in the Gray Herbarium, and as I have observed it many times growing in the Ozark region, closely resembles Nuttall's plant and the specimens collected in Oklahoma in its vegetative characters. The two plants seem, however, to be segregated geographically and ecologically, and to differ constantly in the color of the rays and perhaps in other minor particulars. Judging by Nuttall's plant and the material from Oklahoma, the leaves of *Brauneria atrorubens* are always linear-lanceolate, 8–14 mm. wide, 3-ribbed or rarely with traces of an additional pair, while in *Brauneria paradoxa* the blades of the middle stem-leaves are sometimes as much as 3.5 cm. wide, and with somewhat shorter petioles and 5 distinct ribs. In the Oklahoma specimens referred to *Brauneria atrorubens* the rays are sometimes 4–6 cm. long and distinctly pendulous, while in *Brauneria paradoxa* they are seldom over 3–4 cm. long and are spreading or reflexed, though becoming pendulous as they wither.

Brauneria atrorubens (Nutt.) Boynton & Beadle is evidently a valid name and represents a good species, but without more material

it is difficult to say whether *Brauneria paradoxa* Norton should be regarded as a distinct species or only as a variety of the former. If the latter view is taken it will afford a good opportunity for someone to make a new combination. For the present it seems to the writer safer to maintain both species. More information is also needed to determine the range of the two plants. The label on the type specimen in the herbarium of the Philadelphia Academy of Natural Sciences bears the notation in Nuttall's handwriting: "R. atrorubens. * Ark. Same from N. Carol. Nutt." The asterisk was the author's indication that he considered it a new species. After the published description of *Rudbeckia atrorubens* the habitat or range is given as: "In the plains of Arkansas, and also Georgia, from whence I have received roots from my indefatigable friend, Dr. W. J. Wray." But no material of this species has turned up from the Southeastern States in recent years so far as I can discover, nor is it credited to that region in Small's Flora or in other recent treatments.

In the original description of *Brauneria paradoxa* the author cites a specimen collected by Lindheimer in Texas, but I have never seen it outside of the Ozark region, where it is restricted to glades, usually on magnesian limestone, and where unusual ecological conditions prevail.

This note is written in the hope of eliciting further information about both of the plants under discussion.

Arnold Arboretum.

A NEW IRIS FROM CALIFORNIA

Robert C. Foster

In the unidentified material of *Iris* in the Gray Herbarium two sheets of the same species have been found, belonging to the section *Apogon*, subsection *Californicae*. Upon comparison with the types of several species of this group and characteristic material of the remaining members, differences are apparent, so distinct as to warrant the addition of a new species to the subsection.

Iris **Thompsonii**, spec. nov., planta caespitosa; rhizoma gracilis, plus minusve 1 cm. diametro, vadosa crescente; folia pauca, linearia, acuta, ad 30–35 cm. longe, caule excedentia, 3–5 mm. lata, nervis prominentibus, subglaucescentia; caulis simplex, 10–25 cm. altus, 2–3 foliis angustatis, reductis, ½–⅔ liberis, ornatus; spathae valvae

parum inaequilongae, 1–2-fl., subcarinatae, anguste lanceolatae, herbaceae, 3½–5 cm. longae, 6–9 mm. latae; pedicelli plus minusve 12 mm. longi, primus quam secundus brevior; ovarium 1–2 cm. longum, ad basim apicemque aeque fastigatum, gradatim in tubum praeteriens; perianthii tubus linearis, plus minusve 13 mm. longus; perianthii segmenta exteriora oblanceolato-spathulata, lamina in unguem gradatim attenuata, apice obtuse rotundata, coeruleo-purpurea, 35–38 mm. longa, 10–13 mm. lata; segmenta interiora angustiora, oblanceolato-spathulata, apice obtusa, 32–38 mm. longa, plus minusve 7 mm. lata; styli rami 2 cm. longi; cristae quam styli rami breviores, subquadrato-triangulae, non lineares, distincte crenatae, 7–10 mm. longae; stigma triangulare, acutum; filamenta circa 8 mm. longa, antheris aequilongis; capsula immatura, sed 25 mm. longa, abrupte ad rostratam fastigata; semina non visa. Northwest California and southwest Oregon. California: Del Norte Co.: Douglas Park, semi-open slopes ½ mile from the Smith River, about 500 ft. alt., June 5–7, 1928, *J. W. Thompson*, no. 4510 (type, in Gray Herb.). Oregon: Curry Co.: summit of Pistol River Mtn., June 5, 1928, *J. W. Thompson*, no. 4547a.

This distinct and charming little species I am happy to name for its discoverer, Mr. J. W. Thompson, of Seattle, Washington, who has been kind enough to permit me to see additional material of it, and to send me notes upon its habitat. According to him, it is a "handsome, deep blue species, densely cespitose," found in a region "on the edge of the coast redwoods, *Sequoia sempervirens*." Closely associated with it are *Arctostaphylos*, and *Pyrola dentata*. In addition to the type in the Gray Herbarium, sheets have been seen from the United States National Herbarium, the Herbarium of the Missouri Botanical Garden, and the herbarium of the collector, Mr. Thompson. These may be designated as co-types.

It is unlikely that *I. Thompsonii* will be confused with any other member of the *Californicae*, except, perhaps, its nearest relative, *I. innominata* Henderson, from which it differs in the following respects: shorter perianth-tube, more narrowly lanceolate spathes, cauline leaves free for a greater portion of their length, perianth-segments smaller, slighter, more nearly spatulate, and filaments and anthers equal in length. From typical *I. macrosiphon* Torr., it differs in having longer stems, with longer and narrower cauline leaves, narrower and less glaucous leaves, much shorter and broader spathe-valves, shorter perianth-tube (about one-third the length of the other), smaller flowers, shorter style-branches, and larger style-crests.

Photo. E. C. Ogden

Solidago multiradiata: fig. 1, plant, × 1, from Labrador. S. multiradiata, var. parviceps: fig. 2, type, × 1.

With the type specimen I have associated *Thompson*, no. 4547a from southwestern Oregon, not far north of the type locality. Although it appears to be an alpine ecotype of *I. Thompsonii*, certainty is impossible since the single flower is poorly preserved. In most respects it seems to be a miniature version of the typical form, with the spathes somewhat narrower in proportion to their length, but such differences as exist do not justify giving it separate status as a form, particularly on the basis of a single specimen.

Gray Herbarium,
Harvard University.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXIII.

M. L. Fernald

(*Continued from page 182*)

VI. STUDIES IN SOLIDAGO

Solidago petiolaris Ait. The late K. K. Mackenzie substituted for *S. petiolaris* the name *S. Milleriana* Mackenz. in Small, Man. 1350, 1503 (1933), on the first cited page giving in marks of quotation as a synonym of his new name "*S. petiolaris* Ait.", on p. 1503 "Solidago Milleriana Mackenzie. *Solidago petiolaris* Authors, not Ait." The inference is clear that Mackenzie thought that *S. petiolaris* Ait. has been misidentified by American authors. Aiton's species had been received at Kew from Philip Miller; consequently, if the plant which has passed regularly as Aiton's *S. petiolaris* is not what Aiton had from Miller, it seems a somewhat tangled philosophy which produces for it the name *S. Milleriana*. I do not know Mackenzie's reason for supposing that his *S. Milleriana* is not *S. petiolaris* Ait. The characterization of the latter was brief and clear:

> S. caule erecto villoso, foliis ellipticis scabriusculis petiolatis, racemis erectis elongatis.

Mackenzie's *S. Milleriana* has

> Stem . . . strict, closely short-hispid above, . . . : leaf-blades oblong-oval, . . . scabrous-hispidulous above, sparsely pubescent beneath . . . : heads 7–8 mm. high: involucral bracts lanceolate, acute, appressed-pubescent, all except the inner with spreading tips.

Aiton did not describe the involucre; but portions of Aiton's type, presented to Asa Gray in 1881 and now preserved in the Gray Herbarium, show the very distinctive heads with lance-attenuate, pubescent bracts, and the oblong or elliptic, entire leaves with scabrous upper surface, minutely pilose lower surface and scabrous-ciliolate margins exactly as in *S. Milleriana.* In brief, *S. petiolaris* Ait., as shown by the original material, was well described by its author and is exactly the plant correctly called *S. petiolaris* by Gray in the Synoptical Flora. It is identical with *S. Milleriana* Mackenzie and the latter name is a synonym which might well have been avoided.

Solidago multiradiata Ait., var. **parviceps**, var. nov. (tab. 417, fig. 2), forma typica recedit involucro parvo 3–4(–5) mm. longo bracteis circa 15.—Quebec: damp calareous cliff, "Monts Appalaches, near Cape Rosier, Gaspé Co., July 9, 1931, *G. L. Stebbins, jr.* (type in Gray Herb.)

Typical *Solidago multiradiata* (fig. 1) which abounds on the Labrador Peninsula, in northeastern, northern and western Newfoundland and on the outer coast and the higher mountains of the Gaspé Peninsula, reaching its southern limit on St. Paul Island, Nova Scotia (*Perry & Roscoe,* no. 382), varies in stature from dwarfs of scarcely measurable height to luxuriant clumps 4.5 dm. high; but, whether dwarf or gigantic (for the species) the involucres remain large (5–7 mm. long) with 20–30 bracts. Var. *parviceps,* a local plant of Gaspé, reaches its most extreme development (fig. 2) on the cliffs of the "Monts Appalaches" (the hills between Grand Grève and Cape Rosier) but essentially identical specimens, mixed with more typical *S. multiradiata,* were collected on Mt. Albert by Victorin, Rolland, Brunel & Rousseau in 1923 (no. 17,585) and transitional material had been secured on Mt. Albert in 1881 by John A. Allen, and in 1906 by Fernald & Collins (no. 753). This transitional series indicates that var. *parviceps* is a variety rather than a distinct species.

Solidago decumbens Greene, var. **oreophila** (Rydb.), comb. nov. *S. oreophila* Rydb. Mem. N. Y. Bot. Gard. 1. 387 (1900).

Solidago oreophila was not described by Rydberg, when he published it, but it is here interpreted as the common extreme of *S. decumbens* growing in the Rocky Mountains lower down than the typical *S. decumbens.* The latter has few heads in a subcorymbiform thyrse and is the alpine extreme of the wide-ranging species, found from 9,000–13,100 feet (2750–4000 m.), on the mountains from Wyoming to New Mexico. At lower levels it passes insensibly into the taller

Photo. E. C. Ogden

Solidago Deamii: fig. 1, type, × 5/12; fig. 2, head from type, × 5; fig. 3, disk-floret from type, × 5.

S. Randii: fig. 4, head, × 5, from Maine; figs. 5 and 6, florets, × 5, from same specimen.

S. racemosa, var. Gillmani: fig. 7, rosette-leaf from the original Gillman material, × 5/12.

Photo. E. C. Ogden

Solidago simulans: fig. 1, type, × 2/5; fig. 2, involucre of type, × 5; fig. 3, disk-flower from type, × 5; fig. 4, disk-corolla, with 2 lobes laid back, × 5; fig. 5, achene from type, × 10.

S. uliginosa: fig. 6, involucre, × 5, from Quebec; fig. 7, disk-corolla, × 5, from same specimen; fig. 8, achene, × 10, from same specimen.

S. austrina: fig. 9, involucre, × 5, from North Carolina.

var. *oreophila* which has a longer, more racemiform thyrse, with the heads tending to be slightly smaller. In the States from New Mexico to Wyoming (the area where the alpine typical *S. decumbens* occurs) var. *oreophila* extends from subalpine areas into the timber ("in timber," "pine woods," "dry pine ridge," "subalpine slopes," "dry hillsides," etc.), its altitudinal range given on the labels as 6560–10,000 feet (2000–3050 m.). Many sheets, such as *Clokey* nos. 2895 and 3896 and *Clements* no. 300, show embarrassingly transitional series and such a sheet as *C. F. Baker's* no. 718, with the elongate thyrse and small heads of var. *oreophila* was identified by Greene as his *S. decumbens;* and the names have been very frequently reversed by those who should rightly apply them if the series can be resolved into two real species. North of Wyoming var. *oreophila* comes down to much lower levels, extending out to the Saskatchewan plains and northward to the valleys of Yukon. My interpretation of *S. oreophila* is supported by the statement of Dr. Aven Nelson, under *S. decumbens:* "*S. oreophila* Rydb. . . . is merely the larger form from the lower stations."[1]

Greene included both extremes in his original *S. decumbens*, Pittonia, iii. 161 (1897), giving an inclusive description of the "Very common species of the Rocky Mountains of Colorado and northward, in subalpine and alpine situations, but occupying dry slopes or summits; forming the greater part of Gray's *S. humilis*, var. *nana*." I am, accordingly, taking up *S. decumbens* in the sense of the alpine extreme which Gray chiefly had as his *S. humilis*, var. *nana*, this interpretation conforming to the later views of Rydberg and others.

As stated, Rydberg originally gave no diagnosis, but he gave sufficient clues so that it is evident that his *Solidago oreophila* was intended for the plant of the Rocky Mountain area with slender and elongate thyrse. His publication was as follows:

Solidago oreophila; *Solidago stricta* Hook. Fl. Bor. Am. **2**: 4, mainly, 1834; not Ait., 1789; *S. humilis* Gray, Syn. Fl. **1**^{2}: 148, partly, as to the Rocky Mountain plant [Man. R. M. 153]; not Pursh.
At an altitude of about 2000 m.
MONTANA: Gap in the belt Mountains above White's Gulch, 1882, *Canby*.

With no diagnosis *Solidago oreophila* must go back for its typification to the earlier defined entities. The Rocky Mountain element placed by Gray under *S. humilis* is clear, so also is the Carlton House plant of

[1] Nelson in Coult. & Nels. New Man. Bot. Centr. Rky. Mts. 505 (1909).

Drummond, cited by Hooker under his inclusive *S. stricta,* for material of the latter sent by Hooker to Asa Gray was included by Gray under his *S. humilis.* Thus it is possible, with the aid of his subsequent descriptions, to interpret what Rydberg meant by *S. oreophila;* but such slipshod publication of new species is not to be recommended to others.

Solidago roanensis Porter, var. **monticola** (T. & G.), comb. nov. *S. Curtisii* T. & G., β.? *monticola* T. & G. Fl. N. Am. ii. 200 (1838). *S. monticola* T. & G. ex Chapm. Fl. 209 (1860), not Jord. (1857). *S. alleghaniensis* House in Am. Midl. Nat. vii. 131 (1921).

Typical *Solidago roanensis* Porter, Bull. Torr. Bot. Cl. xix. 130 (1892), has the thyrse very dense, except sometimes at base; the involucre greenish and herbaceous to membranous and 5–5.5 mm. long; and the ligules deep-yellow. It is confined to the highest mountains of western North Carolina and adjacent Georgia, extending slightly northward into southwestern Virginia. When he described it as a species Porter was familiar with *S. monticola,* to which it has generally been reduced, yet he made no mention of nor comparison with the latter plant; and Asa Gray wrote upon a sheet of the large *S. roanensis* distributed as *S. monticola* from Roan Mountain (*J. D. Smith*): "Yes. I could not have thought it." Nevertheless there seems to be no clear line to separate it and the smaller *S. monticola* and even in Mackenzie's treatment in Small's Manual the two are united. Var. *monticola,* with a broader range, often at lower altitudes, from Maryland to Kentucky, southward to Georgia and Alabama, is smaller throughout, the slender thyrse or the slender racemiform branches (when a panicle is developed) more open; the involucres 4–5 mm. long, usually paler; and the ligules paler yellow or even whitish.

Solidago (§Virgaurea) **Deamii,** n. sp. (tab. 418, figs. 1–3), *S. Randii* similis; caule 4–5 dm. alto supra minute piloso; foliis coriaceis pallidis glabris, basilaribus rosulatis obovatis apice rotundatis grosse serrato-dentatis basi late petiolatis, laminis 3.5–5.5 cm. longis 2–3.5 cm. latis; foliis caulinis 35–40, imis subpetiolatis oblanceolatis serratis, mediis superioribusque sessilibus minoribus integris acutis; inflorescentia thyrsoidea densa 1 dm. longa 4 cm. diametro; pedicellis nullis aut 1–8 mm. longis strigoso-pilosis; involucris cylindrico-campanulatis 6–9 mm. longis; bracteis stramineis chartaceis obtusis, 4-seriatis, exterioribus viridicostatis, costa dilatata, interioribus elongatis; disci floribus circa 12, lobis corallae 2 mm. longis; ligulis 8 luteis; antheris 2.7–3 mm. longis; achaeniis immaturis strigoso-pilosis.

—INDIANA: in a blow out at end of Section Line Road 2 miles east of Tremont, Porter Co., September 14, 1923, *C. C. Deam*, no. 39,707 (TYPE in Gray Herb.).

Solidago Deamii (FIG. 1) has the strongly coriaceous foliage of *S. speciosa* Nutt., but its strongly toothed and short-petioled radical leaves and its pubescent achenes promptly distinguish it from the smallest extremes of *S. speciosa*, which has long-petioled and entire or but slightly toothed radical leaves and glabrous achenes. In habit and in the crowded, sessile or short-pedicelled heads *S. Deamii* is suggestive of *S. Randii* (Porter) Britton, of northern New England, southern Quebec and northeastern New York; but *S. Randii* has submembranous dark-green foliage, the involucres (FIG. 4) smaller (5–6 mm. long), with thinner and narrower bracts, the orange-yellow disk-corollas (FIGS. 5 and 6) with shorter lobes and shorter (1.5–2 mm. long) anthers, the corolla-lobes and anthers (FIG. 3) of *S. Deamii* being much longer. *S. Deamii* is also related to *S. racemosa* Greene, var. *Gillmani* (Gray) Fern., but that has the leaves submembranaceous, the radical (FIG. 7) elongate-oblanceolate and acute, the heads mostly long-pedicelled and the involucral bracts narrower.

SOLIDAGO **simulans**, sp. nov. (TAB. 419, FIGS. 1–5), planta *S. uliginosam* simulans; caule crasso glabro 8 dm. alto; foliis subcoriaceis glaberrimis eciliatis, basilaribus late oblanceolatis acutis 3–3.5 dm. longis 4.5–5 cm. latis crenato-dentatis basi attenuatis petiolo alato; foliis caulinis circa 20, imis elongatis petiolatis mediis superioribusque sessilibus minoribus lanceolatis integris acutis; inflorescentia cylindrico-thyrsoidea densa 2 dm. longo 3 cm. diametro ramis glabris brevis capitulis 3–10 gerentibus; pedicellis glabris 3–4 mm. longis; involucris cylindrico-campanulatis 6–7 mm. longis; bracteis stramineis chartaceis, 4-seriatis, exterioribus lanceolato-deltoideis subacutis, interioribus oblongis vel oblongo-lanceolatis obtusis vel subacutis; disci floribus 9, tubo 2 mm. longo, fauce 2.5 mm. longo, lobis 2 mm. longis; ligulis 7, 1.5 mm. latis; achaeniis maturis lineari-cylindricis 8–10-costatis strigoso-hirtellis 3.3–3.5 mm. longis.—Macon County, NORTH CAROLINA: moist rocks on the high mountains of Macon County, near Highlands, September 15, 1897, *Biltmore Herb.*, no. 5730 (TYPE in Gray Herb.); Wild Cat Ridge, Highlands, October, 1902, *E. E. Magee.*

Solidago simulans so closely resembles *S. uliginosa* Nutt. that it has been mistaken for it. It differs at once in its glabrous inflorescence, larger involucres (FIG. 2), long throat and limb and short tube of the disk-corolla (FIGS. 3 and 4) and much longer definitely pubescent achenes (FIG. 5); the branches of the thyrse and the pedicels of of *S. uliginosa* being hirtellous, the involucre (FIG. 6) only 4–5 mm.

long and with narrower bracts, the disk corollas (fig. 7) with relatively longer tube and shorter throat and limb, the achenes (fig. 8) only 1.5–2 mm. long and usually glabrous. *S. simulans,* as yet known only from the high mountains of Macon County, North Carolina, is to be watched for elsewhere along the Blue Ridge. It is the extreme southern and montane representative of *S. uliginosa,* which crosses eastern Canada from Labrador to Manitoba, and reaches its south-eastern limit in West Virginia (Gormania, alt. 2500 feet, *Svenson,* no. 4449).

Solidago simulans might, by current treatments, be traced to *S. austrina* Small. It differs from the latter in many characters: leaves with quite smooth margins (in *S. austrina* scabrous-ciliolate), the basal 3–3.5 dm. long and 4.5–5 cm. broad (in *S. austrina* 0.7–1.5 dm. long and only 1–2.5 cm. broad); cauline leaves about 20, attenuate-tipped, the median 1 dm. or more long (those of *S. austrina* 30–60, the middle and upper bluntish or with blunt callous tip, the median 3–5 cm. long); inflorescence dense, its racemes cylindric, not secund (in *S. austrina* lax and open with strongly secund racemes); involucre cylindric-campanulate, 6–7 mm. high, with chartaceous bracts, the outer lance-deltoid and acutish not conspicuously continued down the pedicels (in *S. austrina* the broader campanulate involucre (fig. 9) shorter, with firm, green, oblong, obtuse bracts continuing indistinguishably down the pedicels); disk-corollas 6.5 mm. long (in *S. austrina* 3.7–4.5 mm.); mature achenes 3.3–3.5 mm. long (in *S. austrina* 2–3 mm.).

Shifting of Names versus Accurate Identifications (Plate 420). It is a commonplace to note that long-continued cultivation of plants, particularly if they be of naturally plastic groups and placed side-by-side with scores of their relations, renders them in some ways unlike the indigenous ancestors from which they were in part derived. This observation, though trite, is important in connection with the species of *Solidago* early proposed in Europe from plants which had long grown in the gardens. In his masterly and cautious life-long studies of the genus Asa Gray repeatedly commented on the impossibility of satisfactorily identifying with wild American plants most of the garden forms described by Willdenow, Miller and some other European authors. Occasionally the types of species described by Aiton from plants not too long grown and mixed with other species at Kew can be safely identified; but too many of Miller's types, from plants long grown in the old Chelsea Garden, are better allowed to

Photo. E. C. Ogden

Solidago conferta: fig. 1, inflorescence, × 1, after Miller.
S. speciosa: fig. 2, upper half of inflorescence, × 1, from Massachusetts.

Photo. E. C. Ogden

SOLIDAGO NEUROLEPIS: FIG. 1, TYPE, × ⅖; FIG. 2, lower surface of leaf, × 10, from TYPE; FIG. 3, involucre, × 5, from TYPE; FIG. 4, achene, pappus and disk-corolla, × 10, from TYPE.

sleep where they lie. Among Miller's species which Gray, with the most profound knowledge of the types and their proper interpretation, refrained from placing as an identifiable American species was *S. conferta*.

Nevertheless, in recent years this name has been taken up with confident assurance to displace a perfectly valid and clearly typified name which had had a full century of accurate usage. One of the most definite species of eastern North America is *S. speciosa* Nutt., a tall (up to 2 m.) plant with coriaceous leaves and a thyrse made up of stiffish spiciform racemes of sessile or subsessile heads. The upper half of a characteristic inflorescence from Sheffield, Massachusetts (*F. Walters*) is shown, × 1, in PLATE 420, FIG. 2. But in RHODORA, xxix. 17–19 (1927), the late Kenneth K. Mackenzie took up to replace Nuttall's perfectly familiar and unquestioned *S. speciosa* the name *S. conferta* Mill., asserting that

> This species has been neglected because Miller failed to refer back to his finely illustrated work above referred to [Miller, Figs.] . . . In that work he . . . fully described (p. 170) under the same polynomial as in his later work and with practically identical description . . . the same species. . . . his beautiful colored plate 254, fig. 2, one of the few colored plates of *Solidago* ever published, makes the identification of his species very certain.
>
> *Solidago conferta* Miller is the species which many years later was called *Solidago speciosa* by Nuttall, and we must adopt the appropriate name of Miller instead of Nuttall's excellent name.

Most unfortunately many recent students have followed Mackenzie in discarding *S. speciosa* (PLATE 420, FIG. 2) for *S. conferta* (FIG. 1) and Mackenzie's characteristic positiveness would seem to justify such a procedure. Most of our students are not in a position to weigh such matters and they accept the latest pronouncement without healthy skepticism. Since Miller's plate 254, fig. 2, which unquestionably was his *S. conferta*, was to Mackenzie "very certain"ly *S. speciosa* I am reproducing the inflorescence, × 1, as fig. 1, beside the upper half (fig. 2) of a characteristic thyrse of *S. speciosa*. Miller's plant was described by him correctly as having "The Flowers [*i. e.* heads] . . . produced in single *loose* Spikes from the lower Part of the Stalk at the Wings of the Leaves"—Mill. l. c. 170 (italics mine; the reference to *loose* spikes overlooked, or at least not mentioned by Mackenzie). The accurate characterization by Miller of the loose spikes and the very clear plate, showing the small heads on long filiform pedicels and the long foliaceous divergent bracts, are to me

very convincing reasons for not identifying Miller's garden plant, cultivated in England, with the American *S. speciosa;* and Mackenzie's certainty that the latter name should be thrown aside should serve as a caution to those who, it sometimes seems, are inclined to be more iconoclastic than precise in their identifications of old types.

What American species, if any, was the primary basis of *Solidago conferta* Mill. I do not know. The decidedly non-secund branches of the thyrse place it in the § *Virgaurea* which occurs abundantly in Europe. *S. uliginosa* Nutt. sometimes has the heads on long pedicels but never, so far as I have seen, divergent broadly lance-attenuate leafy bracts; and in the American allies of the European *S. Virgaurea* L. I know none which could safely be forced into *S. conferta.* My own inclination is to leave it, along with many which were specially noted by Gray, as a garden plant of Europe (reputedly of American origin) which cannot be positively identified with any species known to us in the wild.

Other cases of Mackenzie's unjustifiable abandonment of clearly typified and long established names for those which must always be open to question occur. The one here discussed and illustrated should suffice to put students of our flora on guard against such needless and groundless shifting of names.

Solidago juncea Ait., forma **scabrella** (Torr. & Gray), comb. nov. *S. arguta,* γ. *scabrella* Torr. & Gray, Fl. N. Am. ii. 414 (1842). *S. juncea,* var. *scabrella* (Torr. & Gray) Gray, Syn. Fl. i^2. 155 (1884).

Supposed by Gray to be confined to the central states, but now known eastward to the limits of the specific range (Quebec and Virginia). The smooth-leaved typical *S. juncea* also extends as far west and southwest as the scabrous form.

S. juncea Ait., forma **ramosa** (Porter & Britton), comb. nov. *S. juncea,* var. *ramosa* Porter & Britton in Bull. Torr. Bot. Cl. xviii. 368 (1891).

Originally from western New Jersey and adjacent Pennsylvania, Ohio and West Virginia, this form with erect branches occurs sporadically throughout the range of the species, at least eastward to New Brunswick and west to Michigan. It is a striking form but hardly a true geographic variety.

Solidago arguta Ait., forma **tomophylla,** forma nov., foliis caulinis obovatis apice rotundatis vel subtruncatis margine grosse inciso-serratis.—New York: open pasture-slopes at 2100 feet alt.,

Maplecrest (Big Hollow), Green Co., August 26, 1931, *H. K. Svenson*, no. 4668 (TYPE in Gray Herb.).

Forma *tomophylla* is an extraordinary departure from typical *Solidago arguta;* but I can look upon it only as a sporadic variation such as occurs in several other species, exaggeration of the teeth appearing in individuals of *S. hispida* Muhl., *S. puberula* Nutt., *S. multiradiata* Ait., *S. Cutleri* Fern., *S. Randii* (Porter) Britton and numerous others. In *S. arguta*, forma *tomophylla*, however, the outline of the leaf is also aberrant. The sheet in the Gray Herbarium was collected on an excursion of the Torrey Botanical Club and the label says "Common on open pasture slopes, exposed to the south." In mid-August, 1935, Mr. E. C. Ogden and I searched the south-facing slopes above Maplecrest for it without success. *S. juncea* Ait. was abundant, *S. arguta* less so; but, if forma *tomophylla* still grows there, it successfully evaded us.

SOLIDAGO LUDOVICIANA (PLATE 422, FIGS. 2–5). In 1842, knowing the species only from about ten fragmentary specimens, Torrey & Gray treated *Solidago Boottii* Hook. as an all-inclusive species of five defined varieties. Later these varieties, originally designated without names, have received varietal and specific cognomens; and, with fuller material and understanding of their ranges, they are now practically all recognized as definite Alleghenian, Piedmont and Coastal Plain species. One of the latter has been not well understood, and since it is one of the most definite of the complex group it seems important to attempt clarification of it. Torrey & Gray had from Louisiana and Texas plants which they doubtfully placed with *S. Boottii* as

ε? glabrous; stem stout; leaves rigid, oblong, less acuminate, the lower serrate with spreading teeth; racemes dense, very numerous, forming an ample compound panicle.—T. & G. Fl. N. Am. ii. 214 (1842).

In 1882 Gray said under *S. Boottii*

Var. LUDOVICIANA is a dubious form, with larger heads and leaves.—Gray, Proc. Am. Acad. xvii. 195 (1882).

but in the Synoptical Flora he was more definite:

Var. **Ludoviciana,** Gray, l. c. Perhaps a distinct species, stouter, tall, rather large-leaved: lower leaves and lower part of the stem sometimes roughish-hirsute or hispidulous with many-jointed hairs, or glabrous: heads larger, even 4 lines long!—*S. Boottii*, var. ε, partly, Torr. & Gray, l. c.—W. Louisiana, *Hale*.—Gray, Synop. Fl. 1^2. 154 (1884).

Even as left by Gray in 1884 his *Solidago Boottii*, var. *ludoviciana* consisted of a plant with "lower leaves . . . roughish-hirsute or

hispidulous with many-jointed hairs" and another with them glabrous. A large series accumulated in recent years shows that the plants with hirsute leaves and those with them glabrous are, apparently, well defined species: the hirsute one *S. strigosa* Small, Fl. Se. U. S. 1198, 1339 (1903), correctly described with "blades strigose"; the glabrous one *S. ludoviciana* (Gray) Small, l. c. 1199, 1339 (1903), based on *S. Boottii*, var. *ludoviciana* Gray. Of the *Hale* material from western Louisiana marked by Gray as *S. Boottii*, var. *ludoviciana* there are two sheets: the one in the Torrey Herbarium is glabrous (TYPE of *S. ludoviciana* Small) and bears Gray's memorandum, "My specimen of this is hirsute"; the one in the Gray Herbarium is hirsute and bears Gray's memorandum, "The specimen in Hb. Torr. of var. ε? is glabrous." Small having selected the glabrous plant of Hale to stand as the type of *S. ludoviciana*, that point is satisfactorily settled, the hirsute plant of Hale being *S. strigosa* Small. There are, as stated, many collections of both species now in the Herbarium of the New York Botanical Garden, where I have studied them, and in the Gray Herbarium; but, unfortunately, the late K. K. Mackenzie, rapidly becoming blind and suffering from a long-borne infection, apparently could not see them clearly, for at New York several sheets with the characteristic hirsuteness of *S. strigosa* were labelled by Mackenzie "*S. ludoviciana.*" But the most puzzling confusion due to Mackenzie's distressing eye-sight in his later years arises in another connection.

Perplexed by certain inadequate specimens of the plant of southern New Jersey which has there passed as possibly *Solidago yadkinensis* (Porter) Small, I appealed to Mr. Bayard Long, who stated that the New Jersey plant has remained a problem for twenty-five years, a species readily recognizable and carefully accumulated in the local herbarium of the Academy of Natural Sciences of Philadelphia. Mr. Long kindly sent for study a large series of the New Jersey plant, a species of open sandy woods and thickets. In foliage, inflorescence, involucres, pappus, corollas and achenes it is a close match for *S. ludoviciana*, but all carefully collected New Jersey material has abundant filiform stolons and the autumnal rosettes have clearly arisen from such stolons. Otherwise the plant also superficially resembles *S. yadkinensis, S. Boottii* Hook. and *S. strigosa* Small.

In Mackenzie's treatment of *Solidago* in Small's Manual the three latter species, as well as *S. juncea* Ait., *S. arguta* Ait. and *S. Harrisii* Steele, all come under his *Argutae*, defined "Plant without long hori-

Photo. E. C. Ogden

SOLIDAGO NEUROLEPIS: FIG. 1, basal rosette, × 2/5, from TYPE.
S. LUDOVICIANA: FIG. 2, basal rosette, × 2/5, from Virginia; FIG. 3, involucre, × 5, from TYPE; FIG. 4, disk-flower, × 10, from Texas; FIG. 5, achene and pappus, × 10, from New Jersey.
S. JUNCEA: FIG. 6, involucre, × 5, from Massachusetts.

Photo. E. C. Ogden

SOLIDAGO ELLIOTTII, var. TYPICA: plants, × ⅖, from South Carolina.

zontal stolons," etc. The other plants of similar aspect would seem to constitute Mackenzie's *Vernae:* "Plants with long slender horizontal stolons," etc. The *Vernae* of Mackenzie are assigned two species, *S. verna* M. A. Curtis and the new *S. tarda* Mackenzie in Small, Man. 1355, 1509 (1933). I have studied at New York and now have on loan the type of *S. tarda.* In every way it is matched by the freely stoloniferous New Jersey material which is otherwise identical with the type of *S. ludoviciana.* Consequently, it is most significant to find that carefully collected material of *S. ludoviciana* displays the stolons (*A. A. & E. G. Heller,* no. 4122 from Arkansas and *E. J. Palmer's* no. 31714a from Gumwood, Texas—distributed without identification). The identity of *S. tarda* with *S. ludoviciana* seems sufficiently clear. Late in the autumn it produces filiform stolons (FIG. 2); but no material in the two large herbaria studied shows any such tendency in *S. yadkinensis,* the only species with which it might be confused, but from which *S. ludoviciana* differs in having the basal leaves broader and more abruptly contracted at base and less acuminate, the involucres (FIG. 3) even larger, 5–8 mm. high (against 5–6.5), the pappus (FIGS. 4 and 5) 4–5 mm. long (in *S. yadkinensis* 3–4), the disk-corollas (FIG. 4) 4.5–5.5 mm. long (in *S. yadkinensis* 4–4.5) and the achenes (FIG. 5) 2–2.8 mm. long (against 1.5–2.2). Incidentally the flowering periods of the two are quite different. *S. yadkinensis,* chiefly an Alleghenian and Piedmont species, flowers early: July 24–31 in Virginia, late June to early August in North Carolina, August in Georgia, the type, in fruit, collected at the Falls of the Yadkin on August 18th. *S. ludoviciana* is a species chiefly of the Coastal Plain, from Arkansas and eastern Texas to Georgia and in eastern Virginia (locally) and southern New Jersey (more frequently). In New Jersey the specimens in anthesis (rare in the woods, more frequent in the open) were collected from September 4 to October 6; the type of *S. tarda,* barely in flower, was collected in Clarke Co., Georgia on October 20th. There is, then, a difference of several weeks in the flowering periods of the two species.

Although the production of filiform stolons seems to be a specific trait of *Solidago ludoviciana* and their non-production a character of *S. yadkinensis, S. Boottii, S. Harrisii* and *S. arguta,* the character should be used with caution. In all the material of *S. verna,* including the type collection of M. A. Curtis, at Cambridge and at New York I can find no stolons, yet Mackenzie certainly inferred them when he

defined the *Vernae* "with long slender horizontal stolons." In *S. strigosa* which he placed in the *Argutae* "without long horizontal stolons," there are 16 sheets before me. Of these, 13 are either broken off or jerked up, showing no well collected bases; but in *Caroline Dormon's* no. 1 from Natchitoches Parish, Louisiana, the carefully dug base shows the filiform stolons, quite like those of *S. ludoviciana.* On account of these stolons which he specially noted on the sheet, Mackenzie identified the collection as *S. tarda*, but the basal leaves have the characteristic pubescence of *S. strigosa*, not the glabrous surfaces of *S. tarda* (i. e. *S. ludoviciana*). Nevertheless *S. strigosa* can hardly be treated as hirsute *S. ludoviciana.* Its involucres are only 3.5–4.5 mm. high (in *S. ludoviciana* 5–8), its pappus only 2.5–4 mm. long (in *S. ludoviciana* 4–5) and its disk-corollas only 3.5–4 mm. long (in *S. ludoviciana* 4.5–5.5).

The quick way to tell the eastern *Solidago juncea* Ait. from the western *S. missouriensis* Nutt. is by their bases: *S. missouriensis* (with narrow "triple-nerved" leaves), even when pulled up displays filiform stolons; *S. juncea* (with the broader leaves not "triple-nerved") practically never has such stolons. Nevertheless, in the sandy southeastern section of Massachusetts (Cape Cod, Martha's Vineyard, etc.) *S. juncea* with characteristic foliage, involucres and achenes, frequently develops stolons as slender and elongate as does the regularly stoloniferous *S. missouriensis.*

The character, therefore, is one to be used only after critical study and abundant experience. The development of filiform stolons in the late-flowering *Solidago ludoviciana* (*S. tarda*) seems to be a character of value in separating it from the early-flowering *S. yadkinensis*, which, as Messrs. Long, Fogg and I were able to check in eastern Virginia, bears a large rosette on a stout caudex, from which finally the flowering stem arises.

Solidago **neurolepis**, sp. nov. (tab. 421 et tab. 422, fig. 1), *S. strigosae* similis; caule 1–1.5 m. alto glabro vel superne sparse piloso, foliis subcoriaceis supra glabris vel minute scabridulis subtus ad nervos hispidis vel glabratis; foliis rosulatis longe petiolatis petiolis marginatis, laminis oblongo-ovatis 8–17 cm. longis 4.5–10.5 cm. latis grosse serratis, dentibus apice subulatis, basi rotundatis apice acuminatis; foliis caulinis 30–40 imis mediisque oblongo-ovatis vel -obovatis subsessilibus grosse acuteque serratis, superioribus reductis integris; inflorescentia paniculata laxa ramis remotis adscendentibus vel patentibus secundis, inferioribus ad apicem floriferis, superioribus per totam longitudinem floriferis; pedicellis brevibus erectis; involucris

cylindricis 3.5–4.5 mm. altis, bracteis stramineis valde inaequalibus, exterioribus perbrevibus lanceolato-attenuatis, intermediis lanceolato-attenuatis valde costatis costa glutinosa, interioribus linearibus subacutis vel obtusis; disci floribus 4 vel 5, tubo 1–1.5 mm. longo, fauce 1 mm. longo, lobis 0.6–0.8 mm. longis; ligulis 3 vel 4 ca. 0.3 mm. latis; pappi setis 2–2.5 mm. longis; achaeniis maturis 1.3–1.5 mm. longis strigosis.—MISSOURI: dry bank, open woods, Oronogo, Jasper Co., August 29, 1920, *E. J. Palmer*, no. 18,863, distributed as *S. juncea* var. *scabrella*.

Solidago neurolepis, presumably on account of its large basal rosettes (PLATE 422, FIG. 1), was mistaken by Palmer for *S. juncea* and later, by Mackenzie, for *S. ludoviciana*. *S. juncea*, however, has the basal leaves narrower and more tapering at base, without the bristly ciliation of the nerves beneath; its cauline leaves are narrower and more rapidly decreasing upward; its involucre (PLATE 422, FIG. 6) hemispherical, with oblong and blunt bracts, its disk-flowers about 10 and its ligules 8–12. *S. neurolepis* is sufficiently distinct from it in the rounder-based leaves, with characteristic pubescence (PLATE 421, FIG. 2) beneath, the broad and sharply toothed median cauline leaves, the slender heads (FIG. 3) with attenuate bracts and the few flowers. *S. ludoviciana*, as shown on p. 210, has the base (PLATE 422, FIG. 2) with filiform rhizomes and stolons, the leaves quite glabrous, the campanulate involucres (FIG. 3) very large (5–8 mm. high), with oblong and obtuse bracts, with midrib dilated upward, the disk-corollas (FIG. 4) 8–10 and 4.5–5.5 mm. long, the ligules about as numerous and unusually broad, the achenes (FIG. 5) 2–3 mm. long, with pappus 4–5 mm. long.

In habit and large rosette-leaves with veins hispid or hirsute beneath *Solidago neurolepis* is somewhat like *S. strigosa* Small, but that species, like *S. ludoviciana*, is slenderly stoloniferous, and its heads are much fuller than in *S. neurolepis* and with obtuse linear-oblong bracts.

THE VARIATIONS OF SOLIDAGO ELLIOTTII (PLATES 423–425). *Solidago Elliottii* Torr & Gray was originally conceived as a plant of North and South Carolina and Georgia, its type being a specimen from Parris Island collected by Stephen Elliott. Among other characters it had "leaves . . . oblong-lanceolate or elliptical, mucronate-acute or somewhat acuminate . . . veiny, . . . , heads in crowded recurved racemes." It was supposed to be the *S. elliptica* of Elliott, not Ait. At the same time Torrey & Gray

supposed a more northern plant to be *S. elliptica* Ait., but subsequently Gray cast doubt on the identity of Aiton's *S. elliptica* with any indigenous American plant: 'Cultivated from early times in European gardens, not identified as indigenous";[1] and at that time he referred the northern plant to the southern *S. Elliottii,* a course which has been followed by most later students. The only doubt of this identity seems to be the comment by Mackenzie in Small's Manual in his treatment of *S. Elliottii:* "This species seems to be known only from the original specimen from Parris Island, S. C. Specimens ranging all the way from eastern Georgia to eastern Canada have been erroneously referred to it."

Material of the original Parris Island plant preserved in the Torrey Herbarium (with fragments in the Gray Herbarium) agrees with much other material from South Carolina in having elliptical short-tipped, not long-acuminate leaves, and a panicle with strongly divergent or recurving racemes.

In these two characters it is quite distinct from the plant of swamps from Delaware to eastern Massachusetts and Nova Scotia. The latter has the leaves mostly narrower and long-acuminate and the panicle with strongly ascending to barely spreading branches and the foliaceous bracts are usually more developed. Some collections, especially from Rhode Island, strongly approach the South Carolina plant in habit but they have the leaves prolonged as in the usual New England plant. In the details of the heads I find essentially no difference. The South Carolina material (true *S. Elliottii*) has the involucre 4.5–5.5 mm. high, its median bracts 0.8–1 mm. broad, the disk-corollas 4.5–5.5 mm. long with lobes 1.5–2 mm. long, the pappus 3.5–4.5 mm. long and the ripe achenes 1.5–1.8 mm. long. The northern series shows similar measurements, with slightly more variation (due to more abundant material): involucre up to 6.5 mm. high and disk-corollas 4–5 mm. long. There is certainly not enough difference to keep the two series apart as species.

In eastern Virginia *Solidago Elliottii* is represented by a plant with the foliage much as in the northern variety but with a pyramidal open panicle with spreading branches and long-pedicels, the former character reminiscent of true *S. Elliottii.* But this Virginian plant has the involucres and flowers small for the species: involucres 3.5–4.5 mm. high, with the median bracts only 0.5 mm. broad, disk-corollas

[1] Gray, Syn. Fl. N. A. i². 143 (1884).

Photo. E. C. Ogden

SOLIDAGO ELLIOTTII, var. ASCENDENS: TYPE, × 2/5.

Photo. E. C. Ogden

SOLIDAGO ELLIOTTII, var. PEDICELLATA: TYPE, × 2/5.

4–4.2 mm. long, pappus only about 3–3.5 mm. long, and achenes only 1.2 mm. long. It thus approaches *S. rugosa* Mill., var. *sphagnophila* Graves, but that has the small involucres (3–4 mm. long) crowded and short-pedicelled, the smaller disk-corollas (2.5–3.5 mm. long) with lobes only about 1 mm. long, and the short pappus (2–2.5 mm. long) of *S. rugosa.* I am, therefore, tentatively treating the plant of eastern Virginia as a variety of *S. Elliottii.*

Farther south, in Florida, *Solidago Edisoniana* Mackenzie has the aspect of the northern variety of *S. Elliottii*, with the foliose panicle with strongly ascending branches, but its leaves are firmer and more prominently toothed. Its involucres, disk-corollas, and pappus give the same measurements and proportions, except that the pappus may be a fraction of a millimeter longer.

It seems to me, therefore, that *Solidago Elliottii* is best treated as a polymorphous species of the Coastal Plain and adjacent provinces, characterized as a species by its glabrous stems, rachis and foliage, and its large heads (involucre 3.5–6.5 mm. high), broadish, blunt bracts (the median 0.5–1 mm. wide), long disk-corollas (4–5.5 mm. long) with lobes 1.5–2 mm. long, long pappus (3–5 mm. long) and large ligules (0.5–1 mm. broad). It seems to have four geographic varieties:

S. Elliottii Torr & Gray, var. **typica**. *S. Elliottii* Torr. & Gray, Fl. N. Am. ii. 218 (1842); Gray, Syn. Fl. i.[2] (1884), as to southern plant only; Mackenzie in Small, Man. 1358 (1933).—Swamps of North and South Carolina and Georgia. Plate 423.

Var. **ascendens**, var. nov. (tab. 424), foliis oblanceolatis vel oblongis acuminatis submembranaceis; ramis panicularum valde ascendentibus; involucris 4.5–6.5 mm. altis breviter pedicellatis, bracteis mediis 0.7–1 mm. latis; disci corollis 4–5 mm. longis lobis 1.5–2 mm. longis; antheris 1.5–2 mm. longis; pappi setis 3.5–4.5 mm, longis; achaeniis 1.5–1.8 mm. longis.—Swamps and wet thickets, Delaware to eastern Massachusetts; western Nova Scotia. Type: sandy thicket, Harwich, Massachusetts, September 21, 1927, *M. L., Katharine and H. G. Fernald* in Pl. Exsicc. Gray. no. 492 (in Gray Herb.).

Var. *ascendens* is the plant which was mistakenly called *Solidago elliptica* Ait. by Gray. It has generally passed as *S. Elliottii* in the northern Manuals. Freely hybridizing with *S. rugosa* and *S. rugosa*, var. *sphagnophila*. *S. Elliottii*, var. *divaricata* Fernald, Rhodora, xvii. 7 (1915) is a hybrid of var. *ascendens* and *S. rugosa*, var. *typica*.

Var. **pedicellata**, var. nov. (tab. 425), foliis oblanceolatis vel

elliptico-lanceolatis acuminatis, membranaceis; ramis panicularum laxe patentibus; involucris 3.5–4.5 mm. altis longe pedicellatis, bracteis mediis 0.5 mm. latis; disci corollis 4–4.2 mm. longis; pappi setis 3–3.5 mm. longis; achaeniis 1.2 mm. longis.—Eastern Virginia. Type: border of wet pine woods, Eastville, October 12, 1935, *Fernald & Long*, no. 5520 (in Gray Herb.)

A plant in young bud only, from bushy clearings and borders of woods west of Hampton, Virginia (*Fernald, Long & Fogg*, no. 5091) is apparently the same.

Var. **Edisoniana** (Mackenzie), comb. nov. *S. Edisoniana* Mackenzie in Small, 1358 (1933).

The Solidago rugosa Complex (Plates 426–430). Probably no aggregate-species of *Solidago* in America, unless it be the *canadensis* group, is more baffling in its variations than *S. rugosa* Mill. (including *S. aspera* Ait.) . Already difficult enough as a series of plants, its elucidation has not been helped by the interpretation of the late K. K. Mackenzie.[1] Wandering through the mazes of the always vague and often inconclusive pre-Linnean accounts and drawings of plants in European gardens prior to 1753, the initial date of our nomenclature, he concluded that the plant which Linnaeus had cultivated at Upsala and described as *S. altissima*, "Solidago paniculata-corymbosa, racemis recurvis, floribus adscendentibus, foliis enerviis subintegerrimis,"[2] is *S. rugosa* Mill. Early botanists had identified our inclusive *S. rugosa* as *S. altissima*, but Asa Gray, after a life-time of actual study of the original specimens in *Solidago*, settled the matter for all who wish it settled by showing that *S. altissima* must stand for the relative of *S. canadensis* "with thicker and more obscurely triple-nerved leaves than ordinary *S. Canadensis*"; and that the specimen in the much altered and disturbed Linnean herbarium of today, bearing the name *S. altissima* and belonging to *S. rugosa*, was so labeled by Sir J. E. Smith after the death of Linnaeus and cannot be accepted as in any way the Linnean type: "A specimen ticketed . . . by Smith '*altissima*', is the species which has so long [erroneously] passed as *S. altissima*, viz. *S. rugosa*."[3] In the study referred to, Gray concluded that for the plant (our *S. rugosa*) which had erroneously passed as *S. altissima* "we must now fall back to the oldest and in the main most appropriate name, *S. rugosa*, Mill. Dict."[4]

[1] Mackenzie in Rhodora, xxix. 75 (1927).
[2] L. Sp. Pl. ii. 878 (1753).
[3] Gray, Proc. Am. Acad. xvii. 177 (1882).
[4] Gray, l. c. 180.

Gray's decisions were based upon a thorough and dispassionate weighing of the complicated evidence and nothing is gained by attempts to overthrow his decisions merely on the basis of sophisticated bibliographic twists without fuller knowledge of the actual specimens which Linnaeus had before him. Incidentally it should be noted that the original Linnean account (Hortus Upsal. 259) in 1748 said of his *S. altissima* "foliis enerviis integerrimis," a phrase altered in 1753 (our starting point) by changing *integerrimis* to *subintegerrimis*.

The original (1748) account by Linnaeus amplified the brief diagnosis by a series of comparisons with the preceding species, *S. canadensis* L.

> Obs. *Praecedenti valde affinis a qua differt:* 1. Foliis *crassioribus, margine vix vel parum scabris, superficie vix manifeste* trinervi. 2. Caule *duplo altiore, seu quadrupedali.* 3. Tempore *florendi seriore, scilicet octobri.*

Mackenzie's own description of *S. rugosa* (his "*S. altissima*") in Small's Manual reads: "leaf-blades . . . sharply-serrate, . . . thin, prominently veined." Surely, it is most difficult to coordinate Mackenzie's "*S. altissima*" (*S. rugosa*), with sharply serrate, thin, prominently veined leaves with the Linnean account of a plant with entire (or subentire), thick leaves with veins not apparent. Gray's wise decision should be accepted as definitely settling the specific identities; nothing but confusion follows by insisting that by entire, thick and veinless Linnaeus really meant sharply serrate, thin and prominently veined!

As to Mackenzie's insistence that *Solidago altissima* L. is not the tall thick- and often entire-leaved plant with which Gray and afterward I, merely following Gray, identified it, it is noteworthy that the original Linnean account said that the plant flowers later (in October) than *S. canadensis* and that it came from Maryland. As represented in the Gray Herbarium *S. canadensis* is little shown from Maryland southward, while *S. altissima* of Gray's and my own interpretation is more abundant, being the most abundant species of eastern Maryland and Virginia. The *flowering* material bears the following dates:

S. canadensis. From Maryland, September 16; from West Virginia, September 5 and 10.

S. altissima. From Maryland, September 16 and 24; from West Virginia, September 22, October 3 and 19; from Virginia, September 23, October 14 and 20.

I see no grounds for upsetting the use of *S. altissima* for the plant so treated in Gray's Manual.

There is, however, the necessity to settle just which of the numerous variations within the complex series we call *Solidago rugosa* Philip Miller had. So long as the group was treated merely as "Polymorphous, not readily sorted into definable varieties," Gray's treatment in the Synoptical Flora, the question could be passed. But now that we know the thin-leaved plant with elongate and acuminate, sharply serrate, smooth or merely villous-backed blades to have the involucral bracts also thin and elongate (linear-lanceolate and tapering to tip) and to have a broad northern range, while the plants with thicker, firmer and more rugose and harshly scabrous leaves have the involucral bracts commonly linear and round-tipped, and are prevailingly of southern range, the exact identity of Miller's plant becomes important.

Probably there is no type extant for *Solidago rugosa.* Miller's description (species no. 25, Gard. Dict. ed. 8) is not wholly satisfactory, especially his *entire* leaves; but the garden plant was said to have come from New England, to have hairy, round stems 2½ feet high, lanceolate, rough leaves, "those on the lower part are two inches long, and half an inch broad, but are gradually smaller to the top," panicle loose, with long lower branches with intermixed leaves. This, in view of Miller's lack of understanding of more technical characters in *Solidago,* is well enough and nothing will be gained by changing the interpretation of *S. rugosa* as now generally understood. William Aiton (or presumably Solander), who was a contemporary of Miller and had material of his species growing at Kew, supposed *S. rugosa* to be *S. altissima* L., as already sufficiently emphasized. Aiton divided the "*S. altissima*" growing then at Kew into five unnamed varieties, his *S. altissima* ε being what was then understood by Miller's contemporaries as *S. rugosa,* a plant with the habit and narrow-based and acuminate leaves of northern *S. rugosa* but with the margins entire or only barely toothed. That this garden material is quite like the plant which Miller had there can be little doubt. It is the extreme of ordinary *S. rugosa,* as currently understood, with the least developed toothing. The other plants which Aiton associated with it, his *S. altissima* vars. α, β, γ and δ, are slight variations of the same thing, differing in breadth of leaf, toothing of the margin and elongation of panicle-branches. I have before me photographs of all these trivial variations which I took at the British Museum in 1903. They all belong to *S. rugosa* as usually interpreted. In 1814 Pursh took

up three of Aiton's unnamed varieties and assigned them names under *S. altissima*, with the pregnant comment: "It is a very variable species, and scarcely two individuals look alike." Another of Aiton's varieties, his *S. altissima* ε, which Aiton had considered to be *S. rugosa* Mill. (Aiton's material closely matching Miller's description), was treated by Pursh unequivocally as *S. rugosa;* and another, *S. altissima* β. of Aiton, (said by Aiton to be *S. pilosa* Miller) Pursh treated as synonymous with his new *S. villosa*. The type of Aiton's *S. altissima* β = *S. pilosa* Mill., however, is only a slight transition toward the type of *S. villosa* Pursh, photographs of both being before me.

Typical *Solidago rugosa* passes into the ecological var. *villosa*, which was *S. villosa* Pursh. These two plants, predominantly northern and of damp habitats, have usually villous stems, lanceolate to narrowly ovate or oblanceolate, usually sharply serrate leaves which are narrowed to base and acuminate at tip, rather thin, only slightly harsh above, villous-hirsute on the loose but not prominently rugose veins beneath, and their involucral bracts are thin (subherbaceous), greenish and linear or linear-lanceolate and tapering or only subobtuse at tip.

In drier, often quite dry, habitats of the South, extending into the warmer parts of the North, there is another series, *S. aspera* Ait. and *S. celtidifolia* Small, with the stems scabrous-puberulent or short-hirsute (rarely villous); the leaves from lanceolate to rounded-ovate and firm, harshly scabrous above, coarsely rugose-veiny and scabrous-hirsute beneath, the bases mostly rounded and the margins with low or crenate teeth. In these two plants the involucral bracts are rather firm, linear to linear-oblong and usually round-tipped. In their extreme developments they would seem to constitute a separate species, but, unfortunately, too many transitions in leaf-outline, toothing, and involucres occur to allow me to treat them as specifically distinct from *S. rugosa*. Their corollas, pappus and achenes are, likewise, not materially different and I am looking upon them as a pair of somewhat xerophytic austral varieties. This interpretation is strengthened by the fact that the type and a few other extreme specimens of *S. celtidifolia* have the involucral bracts as slender and as thin as in the more northern typical *S. rugosa*, but decidedly longer.

Another series which is quite baffling is the group of glabrous plants which was set off as *Solidago rugosa*, var. *sphagnophila* by Graves in 1904 and, eleven years later, as *S. aestivalis* Bicknell. When Bicknell

described this glabrous plant as a species he correctly characterized it as

> closely related to *S. rugosa*, but having a much earlier flowering period, . . . three to five weeks in advance of *S. rugosa* and much of it . . . past flowering at the time the latter begins to bloom. The close relationship of *S. aestivalis* to *S. rugosa* is evident enough, and examples are not wanting that suggest either that the two are sometimes intergradient or that they occasionally hybridize. Nevertheless it would be little doubted, I think, by anyone coming to know *S. aestivalis*, that it was essentially distinct, and long ago it became to me an authentic and, from its early time of flowering, a particularly interesting member of the golden-rod group. Its smooth and purple striate-angled stem is notably at contrast with the more terete and papillate-hirsute or villous stem of normal *S. rugosa*, although its smoothness may not be taken as a strictly determining character, for *S. rugosa* occasionally passes into glabrate forms; but such divergent plants, as I have met with them on Long Island, are obviously only local variations from the type not at all to be correlated with the normally glabrous stemmed *S. aestivalis*. In view of such variations, however, the characters of the latter might be given less weight did not its definitely earlier flowering period, both in its beginning and ending, imply a very pronounced remove from identity with the broadly similar *S. rugosa*.[1]

Bicknell's discussion will be seconded by all who know the smooth plant of the Coastal Plain and the Piedmont; its early flowering is very real, but the flowering season, as shown in the abundant herbarium material from southern New England, overlaps that of *S. rugosa* more than he found to be the case on Lond Island. The striate-angling of the stem is evident in most material, though occasionally not apparent, and too often in both the northern and inland villous-stemmed *S. rugosa* and in the southern scabrous-hispid *S. aspera* the pronounced angles can be seen (obscured only by the presence of a blanketing pubescence). In plates 426 to 429 I show such stems from the different plants of the group, merely to indicate the difficulty encountered in applying this character as a truly distinctive one.

Bicknell's characterization calls for involucral "bracts linear-oblong to linear, obtuse" as in *S. aspera* and much of *S. celtidifolia*, and in slightly more than half of the material in the Gray Herbarium that is the case; but in the remainder, including some of the type-collection of *S. rugosa*, var. *sphagnophila*, the bracts are as narrow and attenuate as in the most ideal *S. rugosa*. Yet it can scarcely be maintained that Dr. Graves's variety is different from Bicknell's species. Graves's original account called for "Stems . . . angular-striate, very

[1] Bicknell, Bull. Torr. Bot. Cl. xlii. 561, 562 (1915).

smooth, usually dark red or purple . . . involucre . . . its bracts . . . linear-subulate to oblong-linear, acute or obtuse" and Graves gave a discussion very similar to that of Bicknell eleven years later!

As to whether it should be looked upon as specifically distinct from *S. rugosa* there might be an honest difference of opinion, but on account of the discovery of a few plants showing intermediate characters it seems best to regard it as a well marked variety of that species. . . . Not the least interesting feature of this variety is its time of flowering. It is one of our early goldenrods, following close after *S. juncea*, Ait., and *S. odora*, Ait., and antedating *S. rugosa* in the same neighborhood by at least four weeks. This past summer it began to bloom about August first, was well in flower a week or ten days later, and by the end of the month—at a time when the species was barely beginning—the variety was practically out of bloom. . . .

It is readily distinguished from the species by its perfectly smooth, more striate and usually darker stem, and its relatively smooth leaves. Its early flowering season and its habitat also constitute significant points of distinction.[1]

There is much to say for recognizing *Solidago aestivalis* as a species, but I am so constituted that I cannot accept as true species in *Solidago* plants without definite morphological differences. I have vainly sought stable characters of corollas, achenes, pappus and anthers, such as clearly separate these plants from *S. Elliottii* and such as separate all other habitally similar but morphologically distinct species. I should welcome the designation of such characters by those who prefer to call *S. aestivalis* a species; but I am forced, until a new light is shed on the question, to treat *S. aestivalis* as *S. rugosa*, var. *sphagnophila* Graves.

The following brief summary gives the conclusions I reach in studying the group of *Solidago rugosa*. Since the group is so complex I have felt it important for clarity to illustrate each of the varieties I recognize. I have also added some details of involucres, etc. which may be of service.

S. RUGOSA Mill., var. **typica**. *S. rugosa* Mill. Gard. Dict. ed. 8, no. 25 (1768); Pursh, Fl. ii. 337 (1814), and later authors in part. *Virga aurea Novae Angliae, rugosis foliis crenatis* Dill. Hort. Elth. 416, t. cccvii. fig. 396 (1732), very similar to Miller's description and to the Hort. Kew material which Aiton, and after him Pursh, considered *S. rugosa;* the name used by Miller probably derived from Dillenius or from Hermann before him. *S. pilosa* Mill., l. c. no. 9 (1768), as interpreted by Aiton. *S. virginiana* Mill., l. c. no. 11 (1768), as inter-

[1] Graves, RHODORA, vi. 83, 184 (1904).

preted by Aiton and by Pursh. *S. recurvata* Mill. l. c. no. 28 (1768), as interpreted by Aiton and by Pursh. *S. altissima* Ait. Hort. Kew. iii. 212 (1789),[1] including vars.; Pursh, l. c. 336 (1814); Torr. & Gray, Fl. ii. 216 (1842), in part; Mackenzie in Rhodora, xxix. 75 (1927) and in Small, Man. 1358 (1933), not L. Sp. Pl. ii. 878 (1753). *S. altissima, α. vulgaris, β. recurvata* (Mill.) and *γ. virginiana* (Mill.) Pursh, l. c. (1814). *S. altissima*, var. *rugosa* (Mill.) Torr. Fl. N. Y. i. 363 (1843).—Stem sordid-villous, without or with decurrent lines running down the stem from the leaf-bases and midribs; leaves lanceolate to narrowly ovate or oblanceolate, acuminate, gradually tapering at base, commonly sharp-serrate with coarse teeth, usually rather thin and loosely veiny, not conspicuously rugose, more or less villous beneath; the median leaves 0.5–1.3 cm. long; the upper leaves gradually reduced in size, 1–7 cm. long, 0.5–1.5 cm. broad, much shorter than the long curving lower branches of the usually broadly pyramidal panicle; involucres 3–4 mm. high, their bracts linear or linear-lanceolate, thin, greenish, attenuate to bluntish.—Damp open soil, thickets and borders of woods and streams, Newfoundland to Ontario, south to western Virginia, West Virginia and Louisiana, abundant northward, less so southward. Flowering August–October. Passing into vars. *villosa, aspera* and *sphagnophila*. Plate 426.

Vars. *glabrata* and *laevicaulis* Farwell, Am. Midl. Nat. ix. 277 (1925) have the characteristic pubescence through the panicle and on the lower leaf-surfaces, but their stems below the panicle are glabrous.

Var. villosa (Pursh) Fernald in Rhodora, x. 91 (1908). *S. villosa* Pursh, Fl. ii. 537 (1814). *S. altissima*, var. *villosa* (Pursh) Torr. Fl. N. Y. i. 363 (1843), at least as to source of name.—Panicle elongate-pyramidal to cylindric, the lower lateral racemes nearly equaled to overtopped by the large (0.5–1 dm. long, 1–3.5 cm. broad) subtending leaves; involucres as in var. *typica*, often slightly larger; pubescence as in var. *typica* or longer and more copious.—Low grounds, Newfoundland to Ontario, often the abundant form, becoming infrequent southward to Virginia, West Virginia, Ohio and Michigan. Flowering from early July (northward) to October (southward). Plate 427.

Var. sphagnophila Graves in Rhodora, vi. 183 (1904). *S. aestivalis* Bickn. in Bull. Torr. Bot. Cl. xlii. 561 (1915).—Stems glabrous, often purplish, commonly with prominent stripe-like ridges decurrent from the bases of the leaves; leaves glabrous, lanceolate to narrowly elliptic, rather firm, appressed-serrate, the median 0.6–1.2 dm. long, the upper reduced; panicle much as in var. *typica* or more compact, its rachis and branches glabrous or only sparsely pubescent; involucral bracts linear-lanceolate to linear-oblong, acute or obtuse.—Swampy, often boggy, habitats, southern Maine to North Carolina. Flowering through August and September. Plate 428.

[1] Aiton's treatment taken over for the most part by Willd. Sp. Pl. iii^3. 2058 (1804) with the acknowledgment: "*Varietatem α. tandum vidi, a Clariss. Aiton indicatas vero non.* W.

Photo. E. C. Ogden

Solidago rugosa, var. typica: fig. 1, plant, × ⅖, from Connecticut; fig. 2, internode and leaf-bases, × 5, from Maine; fig. 3, lower surface of leaf, × 10, from Nova Scotia; fig. 4, involucre, × 5, from same specimen.

Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. VILLOSA: FIG. 1, inflorescence, × ⅖, from Quebec; FIG. 2, inflorescence, × ⅖, from Magdalen Islands; FIG. 3, internode and base of leaf, × 5, from Newfoundland; FIG. 4, involucre, × 5, from same plant as FIG. 1.

Var. ASPERA (Ait.) Fernald in RHODORA, xvii. 7 (1915). *Virga aurea Americana aspera* Dill. Hort. Elth. 411, t. cccv. fig. 392 (1732). *S. aspera* Ait. Hort. Kew. iii. 212 (1789); Willd. Sp. Pl. iii³. 2057 (1804); Pursh, Fl. 535 (1814), and later authors. *S. altissima* ε, Torr. & Gray, Fl. ii. 217 (1842).—Stems scabrous-puberulent or short-hispid, rarely glabrous, terete or only occasionally angulate-striate; leaves oval or elliptic to lanceolate, rounded at base, subacute to short-acuminate, low-serrate to crenate, sometimes coarsely serrate, scabrous on both surfaces, thick and strongly rugose, the lower surface hispid; median leaves 2.5–10 cm. long, 1.2–4 cm. broad; panicle pyramidal, usually longer than broad, its ascending to spreading branches densely floriferous throughout or the lower sometimes merely leafy-bracted below, the reduced rameal leaves elliptic to lanceolate and acute; involucres 3–4 mm. high; their principal bracts firm, stramineous to pale-green, linear-oblong and round-tipped, 0.4–0.8 mm. broad. —Dry to damp open soil or thin woods and thickets, Florida to Texas, north to southern Maine, Ohio, Michigan and Missouri. Flowering from mid-August to October. PLATE 429.

Although var. *aspera* often appears quite distinct and, as already noted, is of generally more southern range and of drier habitats than var. *typica*, I find altogether too many transitions to justify maintaining it as a species. In view of the consistent and correct application of Aiton's name *aspera*, derived from Dillenius (1732), for more than two centuries, I am purposely maintaining the name in the varietal category, although extreme literalists, who place more weight on the letter of rules than their spirit, might urge my making a new combination based upon *S. aspera* var. *axillaris* Farwell, Rep. Mich. Acad. Sci. xiv. 189 (1913). Needless confusion would result by abandoning the bicentenarian and perfectly understood name *aspera* in its broadly inclusive sense and substituting, on a technicality, a name which was not so intended but which was definitely made subordinate to *aspera* and meant for a minor variation of it. I decline to be technically literal and to make a fetish of minor rules where only confusion and misunderstanding would result. Others, who look upon nomenclature as the end, not the means, will take another view.

Var. *aspera* passes into the following:

Var. **celtidifolia** (Small), comb. nov. *S. celtidifolia* Small, Fl. Se. U.S. 1198, 1339 (1903), and later authors.—Similar to var. *aspera* but the panicle very lax, its few distant very prolonged and divergent branches (up to 4.5 dm. long) floriferous chiefly above the middle, their bracteal leaves elliptic to oval; involucres 3.5–5.5 mm. long, the inner bracts often prolonged, linear, obtuse or acute, often membranaceous. —Dry to moist open woods, clearings and thickets, Georgia to Texas,

north to Virginia, southern Indiana and Arkansas. Flowering through September and October. Plate 430.

Solidago auriculata Shuttleworth ex Blake in Journ. Wash. Acad. Sci. xxi. 326 (1931). *S. amplexicaulis* Torr. & Gray, Fl. N. Am. ii. 218 (1842), not Martens in Bull. Acad. Brux. viii. 67 (1841). *S. auriculata* Shuttleworth ex Gray, Syn. Fl. N. Am. 1^2. 153 (1884), as synonym. *S. notabilis* Mackenzie in Small, Man. Se. Fl. 1353, 1509 (1933).

Mackenzie, in publishing *Solidago notabilis* in 1933, must have overlooked the proper publication in 1931 by Blake of Shuttleworth's manuscript name *S. auriculata.* The latter, validated by Blake, is correct; the former is a synonym.

The Varieties of Solidago nemoralis (Plate 431). As I understand the species, *Solidago nemoralis* Ait. has three strongly defined geographic varieties, probably all of which have been treated as species but which show altogether too much intergradation. Typical *S. nemoralis,* the wide-ranging plant (a New Jersey specimen in the Gray Herbarium matched with the type by Asa Gray and Francis Boott), has the basal leaves broadly oblanceolate to spatulate-obovate; and the principal cauline ones decrease gradually in size to the summit, the upper reduced ones being narrowly oblanceolate. The heads are crowded on the branches of the panicle and vary with habitat and exposure from subsessile to more definitely short-pedicelled.

On the Prairies and Plains much of *Solidago nemoralis* has the leaves narrower, the basal narrowly oblanceolate to lance-linear, the upper cauline linear-oblanceolate or linear. This plant of the Plains has the heads (figs. 3–5) usually large for the species, though equally large heads (figs. 7–9, 11, 12) are often found in the more eastern plant, and the pedicels are often quite evident. This was first described in 1836 as *S. decemflora* DC. Prodr. v. 332 (1836), a sheet of the type number (*Berlandier,* no. 1924) in the Gray Herbarium being (except for greater discoloration) a good match for the type of *S. longipetiolata* Mackenzie & Bush in Trans. Acad. Sci. St. Louis, xii. 87, t. xvi (1902). Much of the latter plant, furthermore, seems to me inseparable from the type-collection of *S. diffusa* Nelson in Bull. Torr. Bot. Cl. xxv. 378 (1898), which, because the name is a later homonym, was altered to *S. pulcherrima* Nelson, l. c. 549 (1898). As far west as Wyoming this extreme of *S. nemoralis* is apparently rare, though it is now known

to reach Montana, Utah and Arizona, for in publishing it Nelson said "It is seemingly quite local as nothing approaching it has been secured in several years' collecting in the state." Nelson also added the illuminating footnote: "Dr. Rydberg suggests that this is the *S. nemoralis* of most of the Western Reports and states that its range extends from Kansas to the Saskatchewan. It is so very different from the eastern *S. nemoralis* that I had not associated the two at all."

The isotype of *Solidago pulcherrima* in the Gray Herbarium has the involucral bracts (FIG. 5) obtuse, the isotype of *S. longipetiolata* has them also obtuse (FIG. 3) but not quite so round-tipped, and the isotype of *S. decemflora* has them (FIG. 4) as in the Mackenzie & Bush type, or slightly acutish. In publishing *S. longipetiolata* Mackenzie & Bush specially emphasized the narrower leaves and the larger heads, which constitute the chief differential characters of the plant of the Plains, but they also said "Distinguished from *S. nemoralis* Ait. by . . . more imbricated involucre, with sharper scales, lower height, more simple inflorescence and much more pubescent achenes." As to the "lower height," they assigned their plant a height of "3–6 dm.", while Nelson had given for his earlier *S. diffusa* "stems 6–8 dm. long." Specimens distributed by Bush as his and Mackenzie's *S. longipetiolata* are 8 dm. high, and large specimens of it from Arkansas are 1.3 m. high. Such a height as the latter for *S. nemoralis* would be unusual and plenty of eastern material from arid and wind-swept habitats is depressed and with stems only 1–2 dm. long. The panicle of the western material is commonly more slender and with less divergent branches than in much of the eastern, but it is altogether too easy to find either form of panicle east or west. As to the "sharper scales" of the plant of the Plains it is significant that Rydberg, not averse to weak species, should have specially separated all the members of the series (*S. nemoralis, S. longipetiolata* and *S. pulcherrima*) from the slenderly stoloniferous *S. mollis*, etc. by "Bracts . . . obtuse."[1] Incidentally, although *S. nemoralis* has the bracts most commonly obtuse, the futility of trying to draw too fine a distinction on this character is shown by the occurrence of plenty of broad-leaved *S. nemoralis* on the Atlantic slope with acutish scales (FIGS. 6, 11, 12). In PLATE 431 I am showing involucres from various areas which should make this point clear; they are all of the same magnification (× 5). FIG. 3, as explained, is from an isotype of *S. longipetiolata*,

[1] Rydb. Fl. Prair. Pl. 792 (1932).

FIG. 4 from an isotype of *S. decemflora* and FIG 5 from an isotype of *S. pulcherrima.* Certainly it is not easy to find fundamental differences to separate these involucres from nos. 7 (from Virginia), 8 (from Pennsylvania), 9 (from Maryland) and 10 (from Rhode Island); and, surely, it is difficult to make out, as Mackenzie & Bush, maintained, that the western has "sharper scales." FIG. 3, from the isotype of *S. longipetiolata* shows them obtuse enough; but FIG. 6 is from a specimen from Maine, FIG. 11, from one from New York and FIG. 12 from one from Prince Edward Island. The plants from which these were taken show no other points of difference to separate them from plants of the Atlantic slope which supply FIGS. 7–10. Similarly with the achenes; I find no appreciable difference. I am, therefore, unable to maintain the plant of the Plains as a species. It seems to me rightly called

S. NEMORALIS Ait., var. **decemflora** (DC.), comb. nov. *S. decemflora* DC. Prodr. v. 332 (1836). *S. diffusa* Nelson in Bull. Torr. Bot. Cl. xxv. 378 (1898), not Gray (1861). *S. pulcherrima* Nelson, l. c. 549 (1898). *S. longipetiolata* Mackenzie & Bush in Trans. Acad. Sci. St. Louis, xii. 87, t. xvi. (1902).—Western Ontario to northern Alberta, south to Kentucky, Arkansas, Texas and Arizona.

In his earlier work Asa Gray interpreted *Solidago decemflora* as *S. radula* Nutt. ("Probably what I referred to S. decemflora, in *Pl. Lindh. 2, p. 222*, likewise belongs here"—Gray, Pl. Wright. i. 95 (1852)); but when he had studied the Berlandier material from Texas, TYPE of *S. decemflora*, he made the correction under his discussion of *S. nemoralis:* "Some of the specimens have narrowly lanceolate leaves, and are S. decemflora DC.!"—Gray l. c. 94.

While botanizing on the "East Shore" of Virginia, in October, 1935, Messrs. Long, Fogg and I were much impressed with the woodland plant which, at least in Northampton County, largely replaces the widespread *Solidago nemoralis.* The latter has the leaves gradually decreasing in size up to the inflorescence, the upper ones being narrowly oblanceolate, and the heads are subsessile or with only very short pedicels and crowded nearly to the bases of the divergent panicle-branches. The plant of pine woods on the Cape Charles Peninsula has the lower cauline leaves as in typical *S. nemoralis* but about midway on the stem they are abruptly reduced in size and altered in form, continuing to the summit as subuniform spatulate-obovate bracteiform leaves. The inflorescence, too, is comparatively lax, with the heads mostly on obvious pedicels up to three times the

Photo. E. C. Ogden

Solidago rugosa, var. sphagnophila: fig. 1, plant, × ⅖, from type-collection; fig. 2, internode and base of leaf, × 5, from type-collection; figs. 3 and 4, involucres, × 5, from type-collection.

Photo. E. C. Ogden

Solidago rugosa, var. aspera: fig. 1, plant, × ⅖, from Massachusetts; fig. 2, internode and leaf-base, × 5, from Connecticut; fig. 3, lower surface of leaf, × 10, from Connecticut; fig. 4, involucre, × 5, from same specimen as fig. 3.

length of the involucre and borne at the tips of the strongly ascending branches. In pubescence, basal and lower cauline leaves, involucres, flowers and achenes the plant is good *S. nemoralis*, its departures being in the reduction and shape of the upper leaves and the looser inflorescence with long ascending leafy branches. Exactly similar plants are in the Gray Herbarium from dry pine-barrens north of Leslie, Georgia (*Harper*, no. 1722), from Louisiana (*Hale*) and from eastern Texas (San Felipe de Austin, *Drummond*, no. 111), while they are strongly approached by material from the cedar glades of Tennessee (*Gattinger*) and from "barrens of Kentucky" (Short). The Texas, Louisiana and Kentucky specimens (along with one from Michigan which I should not place with them) constituted *S. nemoralis*, γ. of Torrey & Gray, with "leaves more scabrous; the upper short, obovate-spatulate." Unfortunately, Torrey & Gray assigned no name to this remarkable southern variety and I cannot find that it has been named, unless it is what Elliott meant when he described *S. cinerascens* Schweinitz in Ell. Sk. ii. 375 (1824). The typification of *S. cinerascens* is mixed between Elliott's own material from Georgia actually described and material, undescribed, which he had received from Schweinitz: "The plant I have described agrees in most respects with specimens sent me under this name from Salem, North-Carolina, by Dr. Schweinitz." In view of this confusion, the very indefinite condition of the Elliott plants and his characterization of the leaves as "long, linear-lanceolate," it is unwise to use for our variety the name given by Elliott to some similar plant; his "*leaves* . . . , the upper distant and small" and his "peduncles . . . longer than the involucrum" sound like it, but it is safer to designate a new type. I am calling the extreme plant of the Southeast

S. NEMORALIS Ait., var. **Haleana**, var. nov. (TAB. 431, FIGS. 1 et 2), foliis caulinis inferioribus oblanceolatis 3–15 cm. longis, superioribus valde reductis spathulatis distantibus 0.5–3 cm. longis; ramibus panicularum ascendentibus apice recurvatis; racemis laxis pedicellis elongatis.—Texas to Georgia, north to Kentucky and eastern Virginia. TYPE: Louisiana, *Dr. Josiah Hale*, included under *S. nemoralis*, γ. Torr. & Gray. Our Virginia material, not so extreme as the type, is from sandy pine woods at and east of Eastville, *Fernald & Long*, nos. 5524, 5525; dry pine woods north of Capeville, *Fernald, Long & Fogg*, no. 5526.

In PLATE 431, FIG. 1 is the type of var. *Haleana*, × 2/5, FIG. 2 an involucre, × 5; the other figures show involucres, × 5, as already explained.

Solidago radula Nutt., var. **laeta** (Greene), comb. nov. *S. laeta* Greene, Pittonia, v. 138 (1903).

Although *Solidago laeta* is not sharply differentiated from *S. radula*, a series of plants extending from Texas into Missouri has the involucral bracts broader and shorter (plate 432, figs. 4 and 5) than in the widely distributed typical *S. radula* (fig. 3). Fig. 3 shows the involucre, × 5 of typical *S. radula* from Grand Tower, Illinois (*Gleason*, no. 1844), fig. 4, an involucre from an isotype of *S. laeta* (*Tracy*, no. 8137) and fig. 5 the most extreme involucre of var. *laeta* (*Cory*, no. 4738), more extreme than in the type, which is somewhat transitional.

Another variation from typical and average *Solidago radula*, also in the southwestern corner of the specific range, Louisiana and eastern Texas to Missouri, has the panicle as broad and with as divergent branches as in the most extreme forms of *S. radula*, but the involucral bracts very slender. Whereas var. *laeta* is the extreme of the specific aggregate with broadest bracts, this is the tendency with the narrowest. I am calling it

S. radula Nutt., var. **stenolepis**, var. nov. (tab. 432, figs. 1 et 2), a var. *typica* recedit bracteis involucri angustioribus, interioribus anguste linearibus 0.3–0.5 mm. latis.—Missouri, Louisiana and Texas. Missouri: rocky open woods, limestone hills, near Carthage, Jasper Co., October 2, 1922, *E. J. Palmer*, no. 22,161 (type in Herb. New York Botanical Garden). Louisiana: Cameron, September, 1906, *R. S. Cocks*, no. 1727. Texas: prairies, Houston, September 18, 1917, *E. J. Palmer*, no. 12,739.

In its very narrow involucral bracts var. *stenolepis* departs from typical *Solidago radula* just as occasional aberrant plants of *S. nemoralis* will sometimes do. In the latter cases the departure seems due to some outside factor; in var. *stenolepis* it has every appearance of being normal.

The type of var. *stenolepis* bears an unpublished specific name written by the late K. K. Mackenzie. His judgment of it may eventually prove correct; as yet I have been unable to find any definite characters of habit, foliage, flowers and fruit which seem to be specific. Another sheet of specimens marked by Mackenzie as belonging to his unpublished species is so different in many characters that I am unable to cite it under var. *stenolepis*. Other sheets sent out by collectors under the unpublished binomial are likewise far removed from the type of var. *stenolepis*. The name given by Mackenzie but not published is so similar to *S. bracteata* Bush (1918) that its formal

publication would lead to confusion. I am, therefore, not using it. PLATE 432, FIG. 1 shows the type of var. *stenolepis*, × ⅖. In FIG. 2 the involucre is shown, × 5, the same magnification as FIGS. 3–5.

SOLIDAGO **Jacksonii** (O. Ktze.), comb. nov. *S. corymbosa* Ell. Sk. ii. 378 (1822 or 1823), not Poir. Encyc. Suppl. v. 461 (1817). *Aster Jacksonii* O. Ktze., Rev. Gen. i. 316 (1891).

VII. MEMORANDA ON ANTENNARIA

ANTENNARIA **munda,** sp. nov. (TAB. 433). PLANTA FOEMINEA; foliis rosulatis spathulatis vel anguste spathulato-obovatis, apice rotundatis, petiolatis, lamina 2–6 cm. longa 1.3–5 cm. lata, 3–5-nervia supra minute canescenti-tomentulosa; stolonibus assurgentibus vel procumbentibus foliis terminalibus rosulatis; caulibus floriferis crassis 1–4 dm. altis dense tomentosis; foliis caulinis 6–15, imis oblanceolatis vel late lanceolatis vel anguste oblongis 4.5–8 mm. latis, mediis superioribusque lanceolatis attenuatis apice subulatis, subulo 0.6–1.4 mm. longo; capitulis 5–20 glomerulatis vel dense corymbosis, corymbis subglobosis 2–4.5 cm. diametro; involucris 8–10 mm. altis; bracteis 3–4-seriatis, basi brunneis vel purpurascentibus, exterioribus anguste oblongis apice obtusis erosis lacteis, bracteis interioribus angustatis acutis; corollis 5.5–7 mm. longis; stylo rufescente exserto bifido; achaeniis maturis 1.5–1.8 mm. longis; pappi setis longioribus 8–9 mm. longis. PLANTA MASCULA (rarissima); parva, 1 dm. alta; corymbis densis 1.5–2.7 cm. latis; involucris 5 mm. altis; bracteis patentibus ovalibus lacteis apice erosis; pappi setis apice dilatatis integris vel undulatis.—Sandy, gravelly or sterile rocky fields and open woods, rarely damp meadows, central Maine to the Ottawa valley, Quebec, west to Thunder Bay Distr., Ontario, south to Massachusetts, Connecticut, northeastern Pennsylvania, central and western New York, northern Indiana and Minnesota. TYPE: sandy wooded slope, Orono, Maine, May 31, 1901, *Fernald* (in Gray Herb.)

Antennaria munda, named for its neat and comparatively elegant appearance as well as for its nearly spherical inflorescence, is the plant which has erroneously passed as *A. occidentalis* Greene. The latter was merely the prairie specimens of *A. fallax* Greene, Pittonia, iii. 321 (1898). Greene published *A. fallax* as occurring only in the District of Columbia; and he separated from it, on the next page (322) the plant "of the Illinois prairie region, and apparently westward to Kansas. . . . The species, as to the typical plant of central Illinois, was too hastily by me concluded to form a part . . . of what I have now named *A. fallax*" (*Greene*, l. c.). Described as "very similar" to *A. fallax* but with "cymose panicle of large female heads more open than in either," Greene's *A. occidentalis* can have

nothing to do with the more northern *A. munda*, which has been erroneously referred to it. Numerous sheets designated by Greene as *A. occidentalis* clearly demonstrate its essential identity with *A. fallax*, one of the most widely distributed species.

Antennaria munda was early supposed to be *A. Farwellii* Greene, l. c. 347 (1898). Several specimens from Mr. Farwell and a collection made by *Fernald & Pease* (no. 3552) at the type station show it to be a unique species, as yet known only from Keweenaw Co., Michigan and from the Bruce Peninsula, Ontario, a singular localization if those cytologists are correct who maintain that the parthogenetic species are modern "throw-offs" which have been rapidly spreading since the Wisconsin glaciation. The basal leaves (fig. 3) of *A. Farwellii* are so very characteristic in their subtruncate summits, with the sides abruptly narrowed to a concave curve, that I am showing them in the plate with *A. munda*.

Antennaria fallax Greene, var. **calophylla** (Greene), comb. nov. *A. calophylla* Greene Pittonia, iii. 347 (1898).

The southernmost representative of *Antennaria fallax* is striking in its very rounded or rounded-ovate rosette-leaves. The generally more northern *A. fallax* has the leaves rhombic-ovate to -obovate and tapering above to a subacute tip. The variety ranges from Georgia to Texas, coming north to North Carolina, Indiana, Illinois and Missouri, in the northern states passing insensibly into *A. fallax*.

Antennaria neglecta Greene, forma **simplex** (Peck), comb. nov. *A. neglecta*, var. *simplex* Peck, Bull. N. Y. State Mus. lxvii. Bot. vi. 33 (1903).

The unusual plants of *Antennaria neglecta* with a single terminal pistillate head are strikingly unlike the common plant with glomerulate to spiciform or racemose inflorescences, but the colonies occur sporadically and have no definite range.

Antennaria neodioica Greene, var. **argillicola** (Stebbins), comb. nov. *A. virginica*, var. *argillicola* Stebbins, Rhodora, xxxvii. 232 (1935). *A. virginica* Stebbins, l. c. 230 (1935).

Var. *argillicola* is well marked by its combination of often low stature, very narrow cauline leaves, relatively small pistillate involucres and the abundant staminate plants with involucres shorter than in the very few and rare staminate plants which are known in *A. neodioica* and its other varieties. The herbarium-specimens sent out indicate that Dr. Stebbins originally treated both his *A. virginica* and

Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. CELTIDIFOLIA: FIG. 1, ISOTYPE of *S. celtidifolia* Small, × ⅖; FIG. 2, involucre, × 5, from Arkansas; FIG. 3, involucre, × 5, from ISOTYPE; FIG. 4, involucre, × 5, from Virginia.

Photo. E. C. Ogden

SOLIDAGO NEMORALIS, involucres, × 5: FIG. 6, from Maine; FIG. 7, from Virginia; FIG. 8, from Pennsylvania; FIG. 9, from Maryland; FIG. 10, from Rhode Island; FIG. 11, from New York; FIG. 12, from Prince Edward Island.

Var. DECEMFLORA, involucres, × 5: FIG. 4, from ISOTYPE; FIG. 3, from ISOTYPE of *S. longipetiolata;* FIG. 5, from ISOTYPE of *S. pulcherrima.*

Var. HALEANA: FIG. 1, TYPE, × ⅖; FIG. 2, involucre, × 5, from TYPE.

its var. *argillicola* as separate species, though in his paper he treated them as a single species. In some characters *A. virginica* is the greater departure from *A. neodioica* var. *attenuata* Fernald, Proc. Bost. Soc. Nat. Hist. xxviii. 245 (1898), in having the pistillate involucres "4.5–6.5 mm." high (Stebbins, p. 231), though changed by Stebbins on p. 234 to "5–6.5," whereas his var. *argillicola* was described on p. 232 with them "5.–6.5 mm." high, changed on p. 234 to "5–7." The change of measurements on the two pages seems to reflect the lack of fundamental differences in the two; and, although in his tabulation of characters on p. 234 Stebbins makes the involucres of the almost strictly pistillate and wide-ranging northern *A. neodioica* var. *attenuata* vary from "7–8" mm. high, it is easy to find northern tall plants of var. *attenuata* with them down to 5.5–7 mm., these too much overlapping the upper measurements given by Stebbins for his *A. virginica.* Furthermore, the small rosette-leaves of the bisexual Alleghenian plants are easily matched by those of the unisexual northern series. As a notable variety of Alleghenian range with both sexes well developed it is definite. As a distinct species it shows altogether too much overlapping of characters. Phylogenetically it may be, as Stebbins maintains, the bisexual and fertile progenitor of the widely dispersed northern and parthenogenetic var. *attenuata.* If, however, we are to follow Stebbins's principle and to distinguish as species the bisexual and the parthenogenetic series which show no other appreciable differences, it should be noted that the northeastern *A. Parlinii* and *A. fallax* are chiefly parthenogenetic, though southward frequently bisexual.

VIII. VARIETIES OF GNAPHALIUM OBTUSIFOLIUM

Gnaphalium obtusifolium L., var. **praecox,** var. nov. (tab. 434, figs. 1–3), foliis supra glabris lucidisque; panicula elongata cylindracea vel thyrsoidea ramis vix furcatis; glomerulis hemisphaericis 1.2–2 cm. diametro; involucris 6–7 mm. altis.—Virginia to Georgia and Alabama. Virginia; without stated locality (presumably near Portsmouth), *Rugel.* South Carolina: sandy roadside by pine woods, 2 miles east of Walterboro, Colleton Co., July 17, 1927, *Wiegand & Manning,* no. 3301 (type in Gray Herb.). Georgia: sandy field, 4 miles southwest of Hinesville, Liberty Co., July 23, 1927, *Wiegana & Manning,* no. 3302; dry bank, River Road, Athens, August 5, 1929, *J. H. Pyron.* Alabama: dry oak-pine thicket, 10 miles north of Dothan, Houston Co., August 11, 1927, *Wiegand & Manning,* no. 3305.

Var. *praecox,* in its elongate inflorescence and very early flowering

is a striking departure from typical *Gnaphalium obtusifolium* and, when better understood, may prove to be specifically separable. *G. obtusifolium* is highly variable. The typical plant (FIG. 4) has a strongly corymbiform inflorescence, the larger plants with elongate and commonly forking branches; its leaves (FIG. 5) are commonly, though not always, glandular or glandular-papillate above, and, as in var. *praecox* (FIG. 2), its stems and branches are closely white-lanate. In the coastal plain area from York Co., Maine and Cape Cod, Massachusetts to eastern Virginia, and locally in the interior in western New York, Kentucky, Missouri and Michigan, var. *micradenium* Weatherby, RHODORA, xxv. 22 (1923), has the non-tomentose stem (FIG. 6) and the narrow leaves (FIG. 7) minutely glandular-puberulent. From the Cape Charles region to Florida var. *Helleri* (Britton) Blake, RHODORA, xx. 72 (1918), has the stem (FIG. 8) glandular-villous, the leaves (FIG. 9) very broad and thin, and the glomerules rather lax (often with long-pedicelled heads).

Typical *Gnaphalium obtusifolium* is a late-flowering plant. The material in the Gray Herbarium shows the flowering period (heads in anthesis) from southern New England to Florida as follows:

Massachusetts	August 14–November 21
Rhode Island	August 19–October 3
Connecticut	August 23–October 10
New Jersey	August 29–October 5
Pennsylvania	August 22–October 1
Virginia	August 26–October 12
North Carolina	September 4–October 30
Florida	August 2–November 23

Var. *micradenium* is also late-flowering:

Maine	August 29
Massachusetts	August 21–October 7
New Jersey	September 6–October 13
Maryland	September 5–October 2
Virginia	September 9–October 12

The few collections at hand of var. *Helleri* also indicate late-flowering:

Virginia	September 29–October 12
South Carolina	October

Contrasted with this universal late-summer and autumn flowering of most of the varieties of *Gnaphalium obtusifolium,* the material at hand of var. *praecox* clearly indicates a much earlier flowering period.

South Carolina	July 17
Georgia	July 23–August 5
Alabama	August 11

Nevertheless, search for technical characters in flowers and achenes has failed to reveal them. The achenes and the corollas of vars. *Helleri* and *praecox* are minutely larger than in typical *G. obtusifolium* and var. *micradenium*, but the differences are so slight that I cannot yet consider them significant. Further collections and fuller knowledge may show them to be constant.

IX. MINOR FORMS AND TRANSFERS

Sarracenia purpurea L., var. **venosa** (Raf.) comb. nov. *Sarazina venosa* Raf., Aut. Bot. 33 (1840). *S. purpurea venosa* (Raf.) Wherry in Bartonia, xv. 3 (1933).

While visiting the Gray Herbarium in January, 1931, Mrs. Agnes M. Ayre, familiar with the typical northern *Sarracenia purpurea* (the national flower of Newfoundland, designated by Queen Victoria), called my attention to the very broad hoods and short pitchers of the southern material as contrasted with the northern specimens of the species. Afterward, knowing his interest in this spectacular group, I called the matter to the attention of Dr. Wherry, and in 1933 in Bartonia he clearly differentiated the southern and northern plants. Although preferring the vague trinomial to the clear designation of the category in his formal transfer, Wherry stated in the preceding paragraph that the plants "are here classed as subspecies." For those of us who prefer the Linnean term *varietas* for such geographically segregated but confluent extremes it becomes necessary to re-transfer the name. The term variety, as used by such discriminating recent taxonomists as the late C. E. Moss, the late Otto Holmberg and countless others of the past (Linnaeus, Willdenow, Roemer, DeCandolle, Kunth, Schlechtendal, Hooker, Torrey, Gray and scores of others), is reasonably clear. The term subspecies is used in so many ways as to be vague. I, therefore, consistently use *varietas* when I mean a geographically somewhat segregated extreme.

Ptelea trifoliata L., forma **pubescens** (Pursh), comb. nov. *P. trifoliata*, β. *pubescens* Pursh, Fl. Am. Sept. i. 107 (1814).

Saxifraga oppositifolia L., forma **albiflora** (Lange), comb. nov. Var. *albiflora* Lange, Consp. Fl. Groenl. 66 (1880). Subsp. *euoppositifolia* Engl. & Irmsch., var. *typica*, subvar. *albiflora* (Lange) Engl. & Irmsch. in Engl. Pflanzenr. iv^{117}. 624 (1919).

For a mere occasional albino, forma *albiflora* seems to have been overweighted with terminology.

Hamamelis virginiana L., forma **parvifolia** (Nutt.), comb. nov.

H. virginica, γ. parvifolia Nutt. Gen. i. 107 (1818); *H. virginiana, β. parvifolia* (Nutt.) T. & G. Fl. i. 597 (1840).

For discussion see Fernald, Rhodora, xxiii. 265 (1921).

Cercis canadensis L., forma **glabrifolia**, n. f., foliis utrinque glabris.—Throughout the general range of the typical form of the species, which has the young leaves pubescent beneath, the mature ones somewhat so.—Type: wooded hillsides, near Washington, D. C., April 20 and May 15, 1896, *E. S. Steele* (in Gray Herb.).

Cercis canadensis may have the leaves white-pubescent beneath when expanding, only slightly pilose beneath or quite glabrous. There seems to be no geographic segregation of the glabrous extreme. As originally described by Linnaeus *C. canadensis* was assigned "foliis cordatis pubescentibus." The late E. L. Greene made much of this description:

> But he who would give to this East North American tree its phytographic deserts, and determine whether it is to be resolved into several varieties or a number of species, must encounter at the outset one grave difficulty, that of the real applicability of the Linnaean name. To the thing which he named *C. Canadensis* he attributed pubescent leaves. Now the great bulk of the material existing in our largest herbaria under that name exhibits foliage that at first and second view impresses one as being glabrous. When you examine the leaf in every part with a magnifier you still find the upper face glabrous, and the lower usually so, in the main, but with some hirtellous hairs along the veins, next the base of the leaf. In only a few instances have I found some scattered hairs between the veins beneath; in a greater number both faces are totally glabrous. Linnaeus writes the leaves of his shrub as pubescent, without qualification. He knew the shrub in young condition both in the garden of Cliffort, and in that at Upsala. The seeds were reputed to have come from Canada or Virginia. No cercis with leaves "pubescent," unqualifiedly so and plainly so, is to-day known from eastern America. No American botanist, describing any so-called *C. Canadensis* has ever reiterated, in relation to such "shrub or tree, that phrase of Linnaeus foliis . . . pubescentibus."[1]

Approximately half the specimens in the Gray Herbarium have the leaves pubescent beneath and many do not require a lens to disclose the hairs. As to Greene's rhetorical and thoroughly typical statement, "No American botanist, describing any so-called *C. Canadensis* has ever reiterated . . . that phrase of Linnaeus foliis . . . pubescentibus," it is evident that Greene made no attempt to see whether they had! In 1785, Humphrey Marshall (Arb. Amer. 32) distinctly said "a little downy underneath"; Michaux (1803) gave a similar account; Pursh (1814) had *C. canadensis* "foliis . . . ad

[1] Greene in Fedde, Repert. xi. 108 (1912).

Photo. E. C. Ogden

Solidago radula: fig. 3, involucre, × 5, from Illinois.
Var. laeta: fig. 4, involucre, × 5, from isotype; fig. 5, involucre, × 5, from Texas.
Var. stenolepis: fig. 1, type, × 2/5; fig. 2, involucre, × 5, from type.

Photo. E. C. Ogden

Antennaria munda: fig. 1, portion of small pistillate plant, × 1, from Vermont; fig. 2, portion of staminate plant, × 1, from Vermont.
A. Farwellii: fig. 3, characteristic basal leaves, × 1, from Michigan.

axillas nervorum villosis" and var. β, *pubescens*, "C. foliis . . . subtus pubescentibus." Passing many later and accurate accounts we come to Sargent's Silva, iii. 95 (1892): "leaves . . . glabrous . . . or . . . more or less pubescent below." Enough said!

Erigeron pulchellus Michx., var. **Brauniae**, n. var., paginis foliorum glaberrimis marginibus ciliatis, foliis rosulatis imisque integris vel undulatis; caule glabro vel sparsissime piloso.—Kentucky: sandy open woods, Ohio-Kinniconick Divide, Lewis Co., May 7, 1932, *E. Lucy Braun* (type in Gray Herb.).

The wide-ranging *Erigeron pulchellus* Michx. has the stem and usually the lower surfaces of the radical and lower cauline leaves villous and at least the lower (sometimes the upper) blades coarsely dentate. Professor Braun's plant comes from a region of localized endemics and I find nothing like it in other collections from the Ohio-Kentucky-Tennessee area.

I refrain from displacing the well established *Erigeron pulchellus* Michx. (1803) by a doubtful name of Schoepf (1787). In his Materia Medica Americana, David Schoepf published diagnoses (as foot-notes) of several newly described plants. In no case, except possibly the *Erigeron*, did he give any specific epithet to accompany the new diagnosis, merely the generic name: *Asclepias* (p. 30), *Solidago* (p. 123), *Aristolochia* (p. 131). In all cases, except the *Erigeron*, where colloquial names were given they came *after* the specific epithet and the diagnosis, thus:

> 258. TANACETUM *vulgare* foliis bipinnatis incisis serratis. *Linn. Sp. pl.* 1184 . . . —*Tansey.*

In the single exceptional case of the *Erigeron* we get

> 261. ERIGERON.—*Robert's Plantain. Bethlehemi.* Erigeron. *Linn. Amoen. acad.* 4. *p.* 514. loc. Pensylvania—*Perennis.* pharm. *Erigerontis* Rad. Herba.

and as a foot-note a detailed and very characteristic diagnosis of *E. pulchellus.* The unusual position of the latin *Bethlehemi,* after *Robert's Plantain* and separated by a long dash from the generic name, and Schoepf's modesty, in not assigning any specific epithets to his other newly described species, lead me to conclude that *Bethlehemi* was not intended as a specific name. I am, therefore, not disturbing the familiar and properly published name *E. pulchellus,* the type of which is a very full sheet in the Michaux herbarium.

Tanacetum vulgare L., forma **crispum** (L.), comb. nov. *T. vulgare,* β. *crispum* L. Sp. Pl. 845 (1753).

The common form of Tansy with crisped foliage is a forma rather than a true variety.

EXPLANATION OF PLATES 412–434

Plate 412. Potamogeton tennesseensis, n. sp.: fig. 1, fruiting top of plant, × 1, from Clear Fork, Tennessee, *Svenson*, no. 6756, type; fig. 2, branch with submersed foliage, × 1, from the type; fig. 3, stipule and base of submersed leaf, × 10, from the type; fig. 4, upper half of submersed leaf, by transmitted light, × 10, from the type; fig. 5, fruiting spike, × 4, from the type; figs. 6 and 7, mature fruits, × 10, from the type.

Plate 413. Pilea pumila (L.) Gray, figs. 1–9: fig. 1, leaf-margin, × 1, from Wallingford, Vermont, July 30, 1907, *Kennedy;* fig. 2, from Dover, Maine, *Fernald*, no. 382; fig. 3, from Ironside, Quebec, *Victorin*, no. 15,811; fig. 4, from Abbot, Maine, *Fernald & Long*, no. 13,514; fig. 5, from Southport, Prince Edward Island, *Fernald & St. John*, no. 7322; fig. 6, seed, × 20, from Orono, Maine, September 3, 1889, *Fernald;* fig. 7 (smallest seed seen), from Abbot, Maine, *Fernald & Long*, no. 13,514; fig. 8, from Westford, Massachusetts, *Emily F. Fletcher;* fig. 9, from Concord, Massachusetts, September 27, 1896, *Williams*.

Var. Deamii (Lunell) Fernald, figs. 10–15: fig. 10, leaf-margin, × 1, from Lancaster, Wells Co., Indiana, August 24, 1902, *Deam*, isotype; fig. 11, from Lake Everett, Indiana, *Deam*, no. 22,076; fig. 12, from Garrettsville, Ohio, *Webb*. no. 640; fig. 13, from Cuthbert, Georgia, *Harper*, no. 1745; fig. 14, seed, × 20, from Fountain Co., Indiana, *Deam*, no. 22,132A; fig. 15, from Sandy Creek Township, New York, *Fernald, Wiegand & Eames*, no. 14,258.

P. fontana (Lunell) Rydb.: fig. 16, seed, × 20, from Big Chapman Lake, Indiana, *Deam*, no. 21,987.

Plate 414. Ranunculus flabellaris Raf.: fig. 1, fruiting branch, × 5/12, from Belmont, Massachusetts, *Pease*, no. 11,849; fig. 2, center of flower, to show stamens, × 4, from Concord, Massachusetts, *St. John*, no. 657; fig. 3, center of flower, × 4, from Grand Isle Co., Vermont, May 24, 1931, *Knowlton;* fig. 4, achene, × 10, from Greenwich, Massachusetts, July 13, 1931, *A. S. Goodale*.

R. flabellaris, forma riparius Fernald: fig. 5, rosette, × 5/12, from Block Island, Rhode Island, *Fernald, Hunnewell & Long*, no. 9511; fig. 6, emersed branch, × 5/12, from North Guilford, Connecticut, July 13, 1904, *W. R. Dudley*.

Plate 415. Ranunculus Purshii Richardson: fig. 5, flower, to show stamens, × 4, from Bonaventure River, Quebec, July 31, 1902, *Williams & Fernald;* fig. 6, achene, × 10, from Dundee, Prince Edward Island, *Fernald, Long & St. John*, no. 7485; fig. 7, flowering branch, × 5/12, from no. 7485; fig. 8, flowering branches, × 5/12, from Electric Peak, Montana, *Rydberg & Bessey*, no. 4106.

R. Purshii, var. prolificus Fernald: fig. 1, type of *R. multifidus*, var. *terrestris* Gray, × 5/12, from Ann Arbor, Michigan, 1862, *Miss Clark;* fig. 2, flower, × 4, from the latter; fig. 3, bud, to show sepals, × 4, from the latter; fig. 4, flower, to show stamens, × 4, from Alpena, Michigan, July 15, 1895, *C. F. Wheeler*.

R. Purshii, forma terrestris (Ledeb.) Glück: three plants, × 5/12, from Leeds, North Dakota, June 11, 1900, *Lunell*.

Plate 416. Aruncus, fruits × 7; flowers × 10; seeds, × 10; leaf-tips, × 1. A. allegheniensis Rydb.: fig. 1, fruits (over-ripe) from Baltimore, Maryland, 1867, *P. V. LeRoy* (isotype); fig. 2, fruits, showing long styles, from Beaver Creek, Allegheny Co., Pennsylvania, *J. A. Schafer*, no. 639; fig. 5, flowers, showing the firm calyx, from opposite Georgetown, District of Columbia, May 28, 1889, *Churchill;* fig. 8, seeds, from near Prince, Monongalia Co., West Virginia, *E. L. Core*, no. 4009.

Photo. E. C. Ogden

Gnaphalium obtusifolium: fig. 4, characteristic inflorescence, × 2/5, from New Hampshire; fig. 5, upper surface of leaf, × 10, from same collection.

Var. praecox: fig. 1, type, × 2/5; fig. 2, portion of stem, × 10, from type; fig. 3, upper surface of leaf, × 10, from type.

Var. micradenium: fig. 6, portion of stem, × 10, from Virginia; fig. 7, upper surface of leaf, × 10, from same collection.

Var. Helleri: fig. 8, portion of stem, × 10, from Virginia; fig. 9, upper surface of leaf, × 10, from same collection.

A. ALLEGHENIENSIS, var. PUBESCENS (Rydb.) Fernald: FIG. 4, fruits, showing slender follicles and long styles, from Augusta, Illinois, *S. B. Mead.*

A. SYLVESTER Kosteletzsky: FIG. 3, fruits, from La Grave, Haute-Alpes, France, *Mathonnet*, no. 1065; FIG. 6, calyx, showing the thin lobes with evident midrib, from near Fiume, Hungary, June 15, 1869, *A. M. Smith;* FIG. 7, seed, from the Carpathian Mts., Austria, *John Ball;* FIG. 9, fruits, from Silverton, Oregon, *J. C. Nelson*, no. 1894 (*A. acuminatus* (Dougl.) Rydb.); FIG. 10, flowers, showing rounded-obovate petals, from near Juvaviam, Salisburgia, *Eysn* in Fl. Exsicc. Austro-Hung., no. 2416; FIG. 11, flowers, showing spatulate petals, from District of Renfrew, Vancouver Island, *Rosendahl & Butters*, no. 66 (*A. acuminatus*); FIG. 12, tip of leaflet, from Asulkan Valley, Glacier, British Columbia, *S. Brown*, no. 601 (*A. acuminatus*); FIG. 13, tip of leaflet from Marienthal, Czechoslovakia, *Petrak*, Fl. Bohem. Morav. Exsicc. no. XI. 1055.

PLATE 417. SOLIDAGO MULTIRADIATA Ait.: FIG. 1, plant, × 1, from Rowsell Harbor, Labrador, *Abbe & Odell*, no. 534.

Var. PARVICEPS, n. var.: FIG. 2, plant, × 1, from "Monts Appalaches," Gaspé Co., Quebec, July 9, 1931, *Stebbins* (TYPE).

PLATE 418. SOLIDAGO DEAMII, n. sp.: FIG. 1, plant, × 5/12, from Porter Co., Indiana, *Deam*, no. 39,707 (TYPE); FIG. 2, head, × 5, from TYPE; FIG. 3, disk-floret, × 5, from TYPE.

S. RANDII (Porter) Britton: FIG. 4, head, × 5, from the type-region, Mt. Desert Island, Maine, September 2, 1892, *Edward L. Rand;* FIGS. 5 and 6, florets, × 5, from the same material.

S. RACEMOSA Greene, var. GILLMANI (Gray) Fernald: FIG. 7, rosette-leaf, × 5/12, from the original Gillman material.

PLATE 419. SOLIDAGO SIMULANS, n. sp.: FIG. 1, plant, × 2/5, from Macon Co., North Carolina, *Biltmore Herb.*, no. 5730; FIG. 2, involucre, × 5; FIG. 3, disk-flower, × 5; FIG. 4, disk-corolla, with 2 lobes laid back, × 5; FIG. 5, achene, × 10; all from the TYPE.

S. ULIGINOSA Nutt.: FIG 6, involucre, × 5, from Magog, Quebec, *Pease*, no. 1485; FIG. 7, disk-corolla, × 5, from no. 1485; FIG. 8, achene, × 10, from no. 1485.

S. AUSTRINA Small: FIG. 9, involucre, × 5, from Falls of the Yadkin River, North Carolina, August 18, 1892, *Small.*

PLATE 420. SOLIDAGO CONFERTA Mill.: FIG. 1, inflorescence, × 1, from the original colored plate in Miller, Figures of Plants, ii. t. ccliv. fig. 2 (1760).

S. SPECIOSA Nutt.: FIG. 2, upper half of inflorescence, × 1, from Sheffield, Massachusetts, August 31, 1915, *F. Walters.*

PLATE 421. SOLIDAGO NEUROLEPIS, n. sp.: FIG. 1, plant, × 2/5, from Oronogo, Jasper County, Missouri, *E. J. Palmer*, no. 18,863 (TYPE); FIG. 2, lower surface of leaf, × 10, from the TYPE; FIG. 3, involucre, × 5, from the TYPE; FIG. 4, achene, pappus and disk-corolla, × 10, from the TYPE.

PLATE 422. SOLIDAGO NEUROLEPIS, n. sp.: FIG. 1, basal rosette, × 2/5, from the TYPE.

S. LUDOVICIANA (Gray) Small: FIG. 2, basal rosette, × 2/5, from northwest of Oyster, Northampton Co., Virginia, *Fernald, Long & Fogg*, no. 5512; FIG. 3, involucre, × 5, from Louisiana, *Hale* (TYPE); FIG. 4, disk-flower, × 10, from Palestine, Anderson County, Texas, *E. J. Palmer*, no. 12,813; FIG. 5, achene and pappus, × 10, from Bennett, Cape May County, New Jersey, *Long*, no. 7945.

S. JUNCEA Ait.: FIG. 6, involucre, × 5, from West Tisbury, Massachusetts, *F. C. Seymour*, no. 1542.

PLATE 423. SOLIDAGO ELLIOTTII Torr. & Gray, var. TYPICA: plants, × 2/5, from Beaufort District, South Carolina, 1885, *Mellichamp.*

PLATE 424. SOLIDAGO ELLIOTTII, var. ASCENDENS, n. var.: TYPE, × 2/5, from Harwich, Massachusetts, *M. L., Katherine & H. G. Fernald* in Pl. Exsicc. Gray. no. 492.

Plate 425. Solidago Elliottii, var. pedicellata, n. var.: type, × ⅖, from Eastville, Virginia, *Fernald & Long*, no. 5520.

Plate 426. Solidago rugosa Mill., var. typica: fig. 1, plant, × ⅖, from Esker Point, Groton, Connecticut, September 7, 1903, *C. B. Graves;* fig. 2, internode and leaf-bases, showing decurrent lines, × 5, from Bingham, Maine, August 29, 1902, *Collins & Chamberlain;* fig. 3, lower surface of leaf, × 10, from Baddeck, Nova Scotia, *Fernald & Long*, no. 22,702; fig. 4, involucre, × 5, from no. 22,702.

Plate 427. Solidago rugosa Mill., var. villosa (Pursh) Fernald: fig. 1, inflorescence, × ⅖, from Rivière du Loup, Quebec, August 3, 1902, *Williams & Fernald;* fig. 2, inflorescence, × ⅖, from Grindstone Island, Magdalen Islands, *Fernald, Long & St. John*, no. 8123; fig. 3, internode and base of leaf, showing decurrent lines, × 5, from St. John's, Newfoundland, *Fernald, Long, & Dunbar*, no. 27,128; fig. 4, involucre, × 5, from same plant as fig. 1.

Plate 428. Solidago rugosa Mill., var. sphagnophila Graves: fig. 1, plant, × ⅖, from Fog Plain Brook, Waterford, Connecticut, August 9, 1903, *Graves* (type-collection); fig. 2, internode and base of leaf, showing decurrent lines, × 5, from type-collection; figs. 3 and 4, involucres, × 5, from type-collection.

Plate 429. Solidago rugosa Mill., var. aspera (Ait.) Fernald: fig. 1, plant, × ⅖, from Chilmark, Massachusetts, *F. C. Seymour*, no. 1362; fig. 2, internode and leaf-base, showing decurrent lines, × 5, from Franklin, Connecticut, September 1, 1911, *R. W. Woodward;* fig. 3, lower surface of leaf, × 10, from Sunkipaug, East Lyme, Connecticut, September 16, 1904, *Graves;* fig. 4, involucre, × 5, from same specimen as fig. 3.

Plate 430. Solidago rugosa Mill., var. celtidifolia (Small) Fernald: fig. 1, isotype of *S. celtidifolia* Small, × ⅖, from Biloxi, Mississippi, *Tracy*, no. 5058; fig. 2, involucre, × 5, from Pulaski Heights, Arkansas, *Demaree*, no. 8181; fig. 3, involucre, × 5, from isotype; fig. 4, involucre × 5, from Capeville, Virginia, *Fernald, Long & Fogg*, no. 5522.

Plate 431. Habit, × ⅖; involucres, × 5. Solidago nemoralis Ait.: fig. 6, involucre, from South Harpswell, Maine, *Greenman*, no. 3502; fig. 7, from Peters Mountain, Virginia, *Steele & Steele*, no. 275; fig. 8, from Reading, Pennsylvania, September, 1890, *H. M. Cushman;* fig. 9, from Ammendale, Maryland, *Hyacinth*, no. 1717; fig. 10, from Providence, Rhode Island, August, 1844, *Thurber;* fig. 11, from Hudson Falls, New York, September 25, 1896, *S. H. Burnham;* fig. 12, from Malpeque, Prince Edward Island, July 26, 1904, *J. Fowler.*

Var. decemflora (DC.) Fernald: fig. 4, involucre from an isotype, Texas, *Berlandier*, no. 1924; fig. 3, from isotype of *S. longipetiolata* Mackenzie & Bush, Jackson Co., Missouri, August 19, 1897, *Mackenzie;* fig. 5, from isotype of *S. pulcherrima* Nelson, Platte Canon, Wyoming, *Nelson*, no. 2761.

Var. Haleana, n. var.: fig. 1, type from Louisiana, *Joshua Hale;* fig. 2, involucre from type.

Plate 432. Habit × ⅖; involucres, × 5. Solidago radula Nutt.: fig. 3, involucre from Grand Tower, Illinois, *Gleason*, no. 1844.

Var. laeta (Greene) Fernald: fig. 4, involucre from isotype of *S. laeta* Greene, from Weatherford, Texas, *Tracy*, no. 8137; fig. 5, involucre of extreme plant, from Boot Springs, Chisos Mts., Texas, *Cory*, no. 7238.

Var. stenolepis, n. var.: fig. 1, type, from near Carthage, Jasper Co., Missouri, *E. J. Palmer*, no. 22,161; fig. 2, involucre from type.

Plate 433. Antennaria munda, n. sp.: fig. 1, portion of small pistillate plant, × 1, from Middlebury, Vermont, May 16, 1899, *Brainerd*, no. 29; fig. 2, portion of staminate plant, × 1, from Middlebury, Vermont, May 10, 1902, *Brainerd.*

A. Farwellii Greene: fig. 3, characteristic basal leaves, × 1, from Keweenaw Co., Michigan, *Farwell*, no. 78.

Plate 434. Gnaphalium obtusifolium L. fig. 4, characteristic inflorescence, × ⅖, from East Jaffrey, New Hampshire, September 2, 1901, *E. F. Williams;* fig. 5, upper surface of leaf, × 10, from the same collection.

Var. PRAECOX, n. var.: FIG. 1, type, × ⅗, from Waterboro, South Carolina, *Wiegand & Manning*, no. 3301; FIG. 2, portion of stem, × 10, from the TYPE; FIG. 3, upper surface of leaf, × 10, from the TYPE.

Var. MICRADENIUM Weatherby: FIG. 6, portion of stem, × 10, from Williamsburg, Virginia, *Grimes*, no. 4351; FIG. 7, upper surface of leaf, × 10, from same collection.

Var. HELLERI (Britton) Blake: FIG. 8, portion of stem, × 10, from Eastville, Virginia, *Fernald & Long*, no. 5550; FIG. 9, upper surface of leaf, × 10, from same collection.

FURTHER NOTES ON OKLAHOMA PLANTS

GEORGE J. GOODMAN

SOME plants not heretofore listed from Oklahoma, so far as the writer knows, are commented on below. All the specimens are in the Herbarium of the University of Oklahoma and the Goodman plants are usually to be found in the larger herbaria of this country as well.

JUNIPERUS MONOSPERMA Sarg. f. GYMNOCARPA (Lemmon) Rehder. Dry hills, 5 miles east of Kenton, Cimarron Co., April 21, 1935, *Goodman*, No. 2409.

BOUTELOUA ERIOPODA (Torr.) Torr. Dry soil, 3 miles east of Kenton, Cimarron Co., Aug. 27, 1934, *Goodman*, No. 2293.

The known ranges of this grama and of the partially naked-seeded juniper are thus extended eastward and into a new state.

LESQUERELLA OVALIFOLIA Rydb. var. **alba**, var. nov., speciei similis, sed floribus albis.—Hilltop, Arbuckle Mts., Murray Co., OKLAHOMA, April 7, 1934, *Goodman*, No. 2077, TYPE (Herb. Univ. Okla.).

The white-flowered phase is accorded varietal rank because of its distinct geographic distribution. It has been found only in limestone soil at the southeast portion of the distributional area of the species.

Other specimens definitely referable to this variety are: open place, Arbuckle Mts., April 23, 1927, *Lois Gould;* upland, Arbuckle Mts., April 13, 1929, *Lois Gould;* rocky ground, Birds Mill, 15 miles south of Ada, Pontotoc Co., April 21, 1935, *Lila Middleton.*

Very probably some of the Oklahoma specimens cited by Payson[1] under *L. ovalifolia* in his excellent monograph of the genus belong to this variety, but even when the pressed specimens are in flower the original color of the corolla is often lost.

DALEA FRUTESCENS Gray. Near Prices Falls, Arbuckle Mts., Oct. 6, 1935, *Mrs. H. M. Hamilton.*

[1] Payson, E. B., Monogr. Genus Lesquerella, Ann. Mo. Bot. Gard. 8: p. 154. 1921.

This very interesting find further adds to the list of plants in the Arbuckle Mts. which are to be found elsewhere on (and frequently only on) the limestone plateaus of central and southern Texas.[1] The known range of this shrubby and handsome *Dalea* is thus extended a great distance to the northward.

Phacelia congesta Hook. Foothills of Wichita Mts., Comanche Co., July 3, 1903, *A. H. VanVleet* No. 109.

The writer finds no evidence of this Texas plant having been found so far north.

Hedeoma camporum Rydb. This pennyroyal, which is fairly common in the western half of Oklahoma, is given a range of "N.D.—Kans." in Rydberg's Flora of the Prairies and Plains. This is probably due to an oversight, as there are several specimens of this species in the widely distributed Stevens collections. Other collections are: Caddo Co., June 27, 1903, *Kline;* Weatherford, Custer Co., June 29, 1920, *Jeffs;* steep sides of prairie ravine, McClain Co., June 17, 1934, *Goodman*, No. 2144.

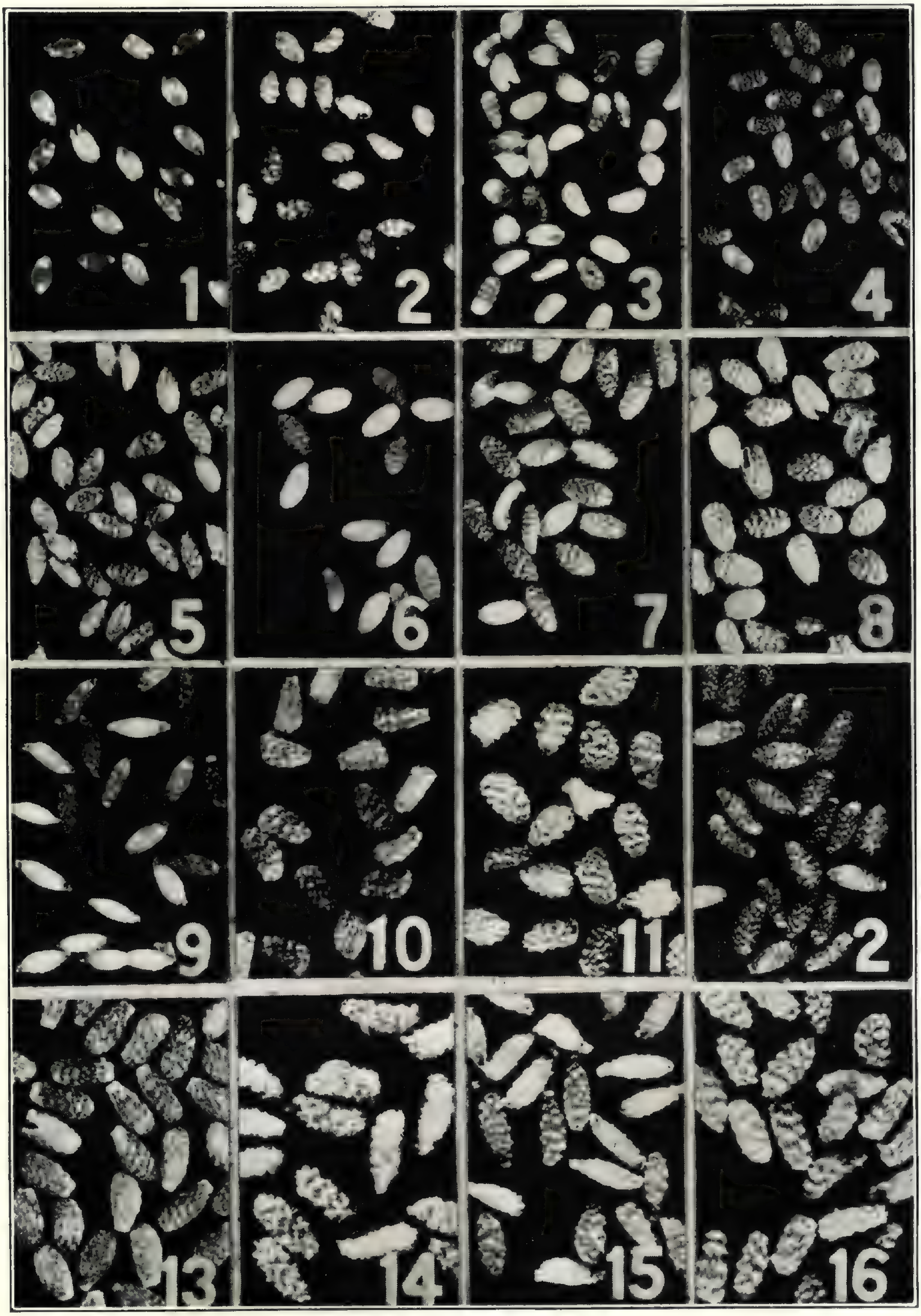
University of Oklahoma, Norman, Oklahoma.

Moss Flora of North America.—Since the writer's review of volume 2, part 1 and volume 3 of this work, in the June 1935 issue of Rhodora, two further installments of volume 2 have been issued.[2] Part 2 takes up the following families: *Ephemeraceae, Disceliaceae, Funariaceae, Splachnaceae, Schistostegaceae, Erpodiaceae*, and *Orthotrichaceae* (in part); part 3 completes the *Orthotrichaceae* and covers the *Timmiaceae, Aulacomniaceae, Bartramiaceae, Meesiaceae*, and *Bryaceae* (in part). The treatment of the *Erpodiaceae* is by Dr. W. C. Steere, of the *Splachnaceae, Timmiaceae* and *Aulacomniaceae* by Miss Geneva Sayre, of the *Bartramiaceae* by Dr. Seville Flowers and of the *Bryaceae* by Dr. A. Le Roy Andrews. The following new species are described *Entosthodon bartramii* Grout, *Ulota funstoni* Grout, *Orthotrichum garrettii* Grout & Flowers, *Anacolia aristifolia* Flowers, *Bartramidula carolinae* Sharp, together with eight new varieties and sixteen new forms. Thirteen species-combinations are here named for the first time plus about twenty-five variety- and form-combinations. Additional parts are expected to appear in the near future.—G. E. Nichols.

[1] Cf. Palmer, E. J., Jour. Arn. Arb. **15**: 127–134. 1934.

[2] Moss flora of North America, north of Mexico, by A. J. Grout. Vol. 2, part 2, pp. 67–138, pls. 26–57, May 1935, and part 3, pp. 139–210, pls. 58–83, December, 1935.

Volume 38, no. 449, including pages 165–196 and plates 412–416, was issued 2 May, 1936.



Seeds of Lobelia, × 12. Fig. 1, L. Cliffortiana; fig. 2, L. Feayana; fig. 3, L. Nuttalli; fig. 4, L. Gattingeri; fig. 5, L. Canbyi; fig. 6, L. spicata, var. originalis; fig. 7, L. spicata, var. campanulata; fig. 8, L. puberula; fig. 9, L. Kalmii; fig. 10, L. glandulosa; fig. 11, L. floridana; fig. 12, L. inflata; fig. 13, L. Dortmanna; fig. 14, L. amoena; fig. 15, L. siphilitica; fig. 16, L. Cardinalis.

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Vol. 38. July, 1936. No. 451.

STUDIES IN THE TAXONOMY AND DISTRIBUTION OF THE EASTERN NORTH AMERICAN SPECIES OF LOBELIA

Rogers McVaugh

(Plates 435 and 436)

The present paper is intended as a study of the distribution of the species of *Lobelia* native to the eastern part of North America, with a view to establishing better understanding of the relationships within the group, the possible origin of the various species, and the relation of this group of species to the world-wide genus *Lobelia*. Early in the study it became clear that the identities of various species were much in doubt, which necessitated considerable taxonomic work, in an effort to clarify the situation so that significant distributional studies could be made.

Most of the work has been carried on at the Botanical Laboratory of the University of Pennsylvania during the years 1933–1935. Two summers have been spent in this time in eastern New York, largely in botanical studies, so that the writer has been able to gain acquaintance with all the northeastern species in the field. The remaining species have been studied only from herbarium material.

During the course of the project about 7000 sheets of dried material have been examined. This has been made possible through the generosity of the following gentlemen, to whom the writer wishes to express his sincere thanks: Dr. R. M. Anderson, National Museum of Canada, Ottawa, Can.; Dr. W. C. Coker, University of North Carolina, Chapel Hill, N. C.; Dr. E. L. Core, West Virginia University, Morgantown, W. Va.; Mr. C. C. Deam, Bluffton, Ind.; Dr. J. H. Ehlers, University of Michigan, Ann Arbor, Mich.; Dr. N. C. Fassett,

University of Wisconsin, Madison, Wis.; Dr. H. A. Gleason, New York Botanical Garden, N. Y.; Dr. E. H. Graham, Carnegie Museum, Pittsburgh, Pa.; Dr. J. M. Greenman, Missouri Botanical Garden, St. Louis, Mo.; Dr. E. M. Gress, State Botanist, Harrisburg, Pa.; Dr. H. D. House, State Botanist, Albany, N. Y.; Mr. Bayard Long, Academy of Natural Sciences, Philadelphia, Pa.; Dr. J. C. McKee, State College, Mississippi; Dr. W. R. Maxon, U. S. National Museum, Washington, D. C.; Dr. Aven Nelson, University of Wyoming, Laramie, Wyo.; Dr. H. J. Oosting, Duke University, Durham, N. C.; Dr. F. W. Pennell, Academy of Natural Sciences, Philadelphia, Pa.; Mr. J. H. Pyron, University of Georgia, Athens, Ga.; Dr. C. O. Rosendahl, University of Minnesota, Minneapolis, Minn.; Dr. R. R. Tatnall, 1100 W. 10th. St., Wilmington, Del.; Dr. T. M. C. Taylor, University of Toronto, Toronto, Can.; Mr. C. A. Weatherby, Gray Herbarium, Harvard University, Cambridge, Mass.; Dr. K. M. Wiegand, Cornell University, Ithaca, N. Y.

Thanks are also due to Mr. S. Savage of the Linnean Society of London, through whose kindness several photographs of Linnean types were secured, to MM. F. Gagnepain and M. Humbert of the Muséum National d'Histoire Naturelle of Paris, who gave information concerning specimens in the herbarium of Lamarck; to Dr. K. D. Doak of the University of Pennsylvania, who gave his time to take the photographs of seeds; to Dr. J. H. Barnhart of the New York Botanical Garden and Miss Ruth Sanderson of the Gray Herbarium, who supplied bibliographic information; to Professor M. L. Fernald of the Gray Herbarium, who placed at the writer's disposal the facilities of that institution.

Finally, to Dr. Edgar T. Wherry, who gave many helpful suggestions and contributed a number of his personal collections for study, and to Dr. John M. Fogg, Jr., whose cooperation made possible the taxonomic part of the work, the writer is deeply grateful.

Historical Introduction

The genus *Lobelia* was unfamiliar to the early European botanists, as only two species are represented in Europe, and these are widely dissimilar in appearance, and not co-extensive in their ranges. It is not until the second half of the 17th century that related species of the genus are consistently grouped together.

The first mention in literature of a species of *Lobelia* appears to be

that made by Charles l'Ecluse (Clusius) in 1611 (*10*). This is a description of *L. Dortmanna* L., and is copied verbatim by Ray (*61*).

A North American *Lobelia* is brought to attention by John Parkinson in 1629 (*51*); he had plants of *L. Cardinalis* L. from France, which had come originally from the St. Lawrence valley. No distinction is made by the early writers between this species and the Mexican *L. splendens* Willd. and *L. fulgens* Willd. (cf. Hernandez (*27*)).

By the end of the 17th century the campanulaceous affinities of *Lobelia* had come to be well recognized: in 1623 Bauhin (*4*) had included *L. urens* L. among the Mustards, but in 1686 Ray (*60*) places all the Lobelias known to him (except *L. Dortmanna* L.) under Rapunculus, which included most of the *Campanulaceae.* Moreover, Plukenet (*53*) distinguishes *Lobelia* (*Rapunculus*) from the rest of the *Campanulaceae.*

The greatest advance in classification, before Linnaeus, is made by Tournefort (*73*), who defines sharply the genus *Rapuntium.*

The name *Lobelia* is first used by Plumier (*54*) for a related genus, *Scaevola* L. Plumier dedicates the genus to Matthias de Lobel (1538–1616), the Flemish doctor and Botanist to James I of England.

After Plumier's use of the name *Lobelia,* it is taken up by Linnaeus for the genus known by the name at the present time (*35–41*).

General Discussion

As understood today, the genus *Lobelia* comprises between 200 and 250 species, widely distributed. The great majority (nearly 9/10) of the named species are native to Australia and South and Tropical Africa, with a large number in South and Central America and Mexico, as well as the Pacific Islands. Several species are found in China and eastern Asia. The genus is represented in western Europe by two species, and is absent from the rest of the northern Eurasian continent except in the extreme east. The North American Lobelias, as treated in the present paper, consist of 27 named species and varieties.

In summarizing, it may be seen that *Lobelia* is largely a genus of the Southern Hemisphere. The same may be said in general of the whole group *Lobelioideae.* Bentham (*5*) (1875) makes the following speculations:

"That the primitive race (a hypothetical ancestor of the whole family Campanulaceae) flourished very early in some region in con-

nexion with Africa. That the Lobeliae were first developed at a time when the geological or other conditions afforded some general means of communication between South Africa and Australia, between Australia, New Zealand, and Antarctic America, between South Africa and extratropical South America." These speculations were made largely because of species or genera common to New and Old Worlds. In addition, Bentham says,

"From thence (the place of origin in the Southern Hemisphere) Lobeliae appear to have spread in several distinct directions into and beyond the tropics, without any transverse northern connexion between the several lines."

It should be pointed out here that too much stress must not be laid upon such evidence as the above, in determining the origin of the North American species, for the following reasons: In the first place, the genus as a whole is evidently highly advanced from an evolutionary standpoint, as shown by the structure of the flower and fruit. Some authors have assumed that the ancestors of the highly advanced *Compositae* must be sought among the *Lobelioideae* (Delpino (*13*); Small (*68*)). Secondly, the world-wide distribution of the various species, combined with the great diversity of vegetative structure, types of inflorescence, types of seed coats, and flower color, points to the conclusion that the group has enjoyed a long evolutionary, or geological, history.

Rock (1919), in his monograph (*63*) of the Hawaiian *Lobelioideae*, says, in speaking of the Hawaiian genera,

"That their age is enormous and that they form with the Compositae the oldest element in our flora may be judged from their numerous species and their distribution over the whole group. . ."

The present writer hopes to show later that several of the North American species are in an old or decadent condition, which is favorable to the assumption of a great age for the genus as a whole.

If it be granted for the moment that the genus actually is a relatively old one, it is logical to assume that groups of species in various parts of the world may have arisen from several sources, which have now disappeared. In other words, two species geographically contiguous at present may have come from two widely separated ancestors, both of which have died out in the intervening geologic time.

This situation seems to be the one now existing in North America; the species here designated as "North American" (*Eulobelia* and *Hemi-*

pogon, in part, of Bentham and Hooker (*6*) (1876)) form a distinct group, apart from the Mexican and South American species, some of which occur naturally or as weeds in Florida, Texas, New Mexico and Arizona. Aside from purely structural characters, most of the species native to the United States and Canada may be shown to have characteristic geographical ranges and probable points of origin which definitely relate them as a group, and separate them from the tropical species now native in Mexico and southward.

The North American Lobelias were included by Bentham and Hooker in their "Genera Plantarum" (*6*) in two sections of the genus, *Eulobelia* and *Hemipogon;* the first of these all North American (except the east-Asiatic *L. sessilifolia* Lamb.), distinguished by the large short-pedicelled flowers in lax terminal racemes; the section *Hemipogon* including species of Europe, Africa, America and Australia, characterized by slender, simple or branching stems and few flowers. These divisions of the genus now seem somewhat artificial. Apparently no adequate classification can be devised, if based upon habit and appearance alone.

Characters used by earlier taxonomists as natural ones, and as criteria of affinity, such as pubescence of the anthers, or the presence or absence of tufts of bristles, seem to be of no great absolute value. The same may be said of the shape of the capsule, which may vary considerably in the same species. The writer has been able to find one character only, by which to separate the North American species from those of other geographical areas: the mature seeds of this group are peculiarly foveolate-reticulate, some more than others, according to species, and indicating several distinct lines within the limits of the group. The seeds of *L. sessilifolia,* which was formerly included in the section *Eulobelia,* are smooth with prominent wings, while the seeds of apparently related Mexican species such as *L. gruina* Cav., *L. fenestralis* Cav., and the tropical *L. Cliffortiana* and its relatives are perfectly ovoid, smooth and shining. No Mexican, Central American or West Indian species seen by the writer has a type of seed even approaching the roughened ones of species of the United States. It is of course obvious that a single character, however fundamental, is never wholly trustworthy in determining relationships. It seems, nevertheless, that an entirely consistent feature such as the above, in conjunction with the evidence from geographical distribution, points to a common origin for our species. Any connection with

an ancestor in the Southern Hemisphere, such as that suggested by Bentham (*5*), must have been very remote in time and before the development of our present forms.

Discussion of Geographical Distribution of Species

The region under consideration is mostly eastern North America, west to the Mississippi Valley; two species of *Lobelia* cross the continent, north of the moraine, and will be considered separately in detail; phases of *L. siphilitica* and *L. spicata* push westward to Colorado and Saskatchewan, respectively; *L. Cardinalis* and its very close relatives occur west to California and well south into Mexico. With these exceptions, all the forms concerned are confined to the eastern half of the continent.

In the first place, it is necessary to consider briefly the geological history of the area in question. During Cretaceous time the general land level in eastern North America was lower than at present, so that the present Coastal Plain was submerged, and the shore line followed the present (*16*) "Fall Line," which runs through New York, Philadelphia, Washington, Richmond, cuts off the eastern third of North Carolina, passes through Columbia, S. C., Augusta and Columbus, Ga.; swings west and north in Alabama, leaving about two-thirds of the state in the Coastal Plain; follows the course of the Tennessee River north to its mouth; passes across southern Illinois and southeastern Missouri; southwesterly through Arkansas, leaving about half the state below it; cuts off the southeastern corner of Oklahoma and passes southward near Fort Worth, Austin and San Antonio.

Upon the elevation of the Appalachian system and emergence of the Coastal Plain, a considerable area was thus thrown open for colonization by plants. We need consider no earlier major geologic changes, since existing species were not then represented on the earth; the only other factor that must be taken into account is that of glaciation.

The latest (and in eastern North America the best marked and usually most extensive) glacial period was in Pleistocene (Wisconsin) time, ending roughly 35,000 years ago. The terminal moraine (*2*) reaches from Nantucket across Long Island to Pennsylvania, southern Ohio, Indiana, and Illinois, then north to Minnesota and west roughly along the 48th parallel. It was formerly held that all land north of this line was covered by a solid sheet of ice, and that all plants now living in this area had migrated from south of the moraine since

Wisconsin time. It has been shown recently, however, by Fernald and others (*11, 17*), that certain areas, such as parts of Newfoundland, were wholly untouched by Wisconsin ice, and students of phytogeography, as well as glacial geologists, are coming more and more to believe that such places as the Bruce Peninsula represent examples of (perhaps much more numerous) tongues of land which were partially unglaciated. If such be the case, many Canadian plants may have persisted in these areas during the ice invasion.

Of the 27 species and varieties here considered, nine are, so far as known, confined to the Coastal Plain, and one reaches above the Fall Line only into the prairies of Arkansas and Oklahoma. Two species (*L. Dortmanna* L. and *L. Kalmii* L.) are northern, and reach non-glaciated country only rarely. The remaining fifteen plants comprise ten rather distinct entities all of which are found in the Appalachian region of the eastern United States (although not necessarily confined to it), and five varieties, which, if not found in the Appalachian region, are clearly derived from the species found there.

The case of the two northern species may be discussed first. *L. Dortmanna* and *L. Kalmii* are clearly very distantly related to other American species, and to each other. The former differs from all other species by the combination of the scapose habit and hollow linear leaves; corolla smooth and slit only part way to the base; anthers all tufted; pedicels ebracteolate and seeds dark, with prominent square base. *L. Kalmii* also differs from all other species, having rather large, smooth flowers, in loose racemes, pedicels bracteolate in the middle, and very finely reticulate, acute-fusiform seeds. Both species are found, in suitable habitats, north of the moraine, from Newfoundland to British Columbia. The former is found also in western Europe (Great Britain, western France, Belgium, Denmark, northern Germany, western Russia, and Scandinavia, as far north as 68°, according to the Illus. Fl. Mit.-Eur. (*26*)); the European and American forms are apparently identical.

All theories as to the origin of these species must remain largely theories only. The modern range of *L. Dortmanna* suggests a circumpolar range in pre-glacial times. The extremely rare occurrence, both of *L. Kalmii* and *L. Dortmanna,* south of the glacial moraine seems to point to a survival within the glaciated area, rather than south of it; however, the scarcity of suitable habitats such as calcareous bogs and sandy ponds in unglaciated country may account for the distribution.

Whatever the explanation of the above, it is sure that any past connection with the remaining species is very remote.

With the exception of the two species just considered, the group as a whole is rather uniform in character and rather closely related, although divisible into the following sub-groups:

a) Species with a smooth lip, small flowers, delicate stems; in Piedmont, Mountains and northeastern Coastal Plain represented by *L. Nuttalli;* this giving way in Florida to *L. Feayana*, which is not surely separable from it by any one character.

b) Species with larger flowers, usually in spikes, a hairy lower lip to the corolla, and an entire corolla-tube (except for the dorsal slit). This is the *L. spicata* complex, which has apparently given rise to *L. inflata, L. Canbyi*, and possibly to *L. Boykinii.*

c) Two species very close to the above, but with characteristic thin and smooth leaves, and secund racemes: *L. Gattingeri* of the uplands of Tennessee, giving way in the Coastal Plain to *L. appendiculata.*

d) Four species evidently related to the last two, but with a tendency to reduction of the stem-leaves, and to a fenestrate corolla (one in which the two upper petals have separated from the corolla-tube near the base): *L. flaccidifolia, L. Halei, L. floridana, L. paludosa.*

e) Large, coarse, smoothish species with showy flowers, the corolla with a smooth lip, fenestrate: the seeds roughly ridged and long rather than ovoid; *L. Cardinalis, L. siphilitica, L. amoena, L. elongata*, possibly *L. glandulifera.*

f) Coarse species with large flowers, fenestrate corolla, smooth lip. Seeds rather small, smoothish, ovoid, resembling those of *L. spicata* and its allies: *L. puberula* and its forms. From a form like *L. puberula* may have come the two species *L. brevifolia* and *L. glandulosa.*

The sub-groups may now be discussed in detail:

a) Inspection of the maps (Figs. 27 and 28) will show the apparent relations: *L. Nuttalli* or its immediate ancestor seemingly migrated in post-Cretaceous times, southeastward onto the emerging Coastal Plain, where it gradually extended its range both northeastward and southward. It did not enter the Florida peninsula, but gave rise there to the rather similar *L. Feayana.*

b) In the Appalachian and Ozark regions the dominant representative of this sub-group is *L. spicata* var. *leptostachys*, which is not found elsewhere, except on the immediately adjacent portions of the Gulf Coastal Plain (Fig. 14); it is not found on the Atlantic Coastal

Plain, being there in part replaced by the var. *scaposa* (FIG. 18); in the northeastern states, west to the Great Lakes, it gives way to the var. *originalis* and the var. *campanulata* (FIGS. 15 and 17). Westward and northwestward, from Illinois and Missouri, the var. *hirtella* appears (FIG. 16). Where the ranges of these varieties overlap, a host of intermediates is found. These cannot be referred with certainty to any of the named forms, and constitute the best reason for reducing *L. leptostachys* from the rank of species, and for postulating that it or a plant similar to it may have been the ancestor of all the varieties of this sub-group (FIG. 19).

It is unfortunate for the sake of clarity that the rules of priority make the northeastern *L. spicata* Lam. the type of the species, for it seems to have been derived from the var. *leptostachys* by the disappearance of the auricles (which sometimes reappear in individuals) and by adaptation to a somewhat more mesophytic habitat. Accordingly, it seems best to refer the northeastern phase to var. *originalis*. The var. *hirtella*, on the other hand, may have arisen from the var. *leptostachys* in a more xerophytic habitat.

Of the three remaining members of this sub-group, *L. Canbyi* is not separable from the *spicata* complex by any character of the corolla; its seeds are almost exactly similar, also. It has seemingly spread from the Appalachian region to the Atlantic Coastal Plain (FIG. 21). *L. Boykinii* is a rather distinct species of the Atlantic Coastal Plain, whose affinities are obscure; it resembles no other species very closely, and seems to approach *L. Canbyi* only through the habit and the slightly hairy lip (FIG. 22).

The final species, *L. inflata*, is very distinct, but seems to show its connection to the *spicata* complex by the spicate character of the young inflorescence, the hairy lip, the seeds, which are very similar to those of *L. spicata* and varieties. It is possible that some connection may be shown through the reduced number of flowers and the subinflated capsule of *L. spicata* var. *campanulata*, but this is only a speculation. *L. inflata* evidently has spread from the Appalachian region; it has, however, been unable to enter the Coastal Plain very extensively (FIG. 20).

c) Logic similar to the above would demand that *L. Gattingeri* be an ancestral type, and have given rise to *L. appendiculata* (FIG. 23). However, the range of the former is so restricted that such a conclusion is largely guesswork; with the reservation that, as stated

elsewhere, the two are difficultly separable in the final analysis other than through geographic range. It would seem to be taxing the power of coincidence to postulate two forms having had exactly parallel development, but no relationship. This is especially true in such a region as the one under discussion, where the evidence seems to be for development away from the Appalachian region, in radial directions.

d) On the southern Coastal Plain occurs this sub-group of four species. They show their relation to *L. Gattingeri* and *L. appendiculata* by a tendency to develop auricles, and by the characteristic bell-shaped capsule. They show their connection to sub-groups (b) and (c) by the spicate habit and the hairy lip. Two of the species, *L. flaccidifolia* and *L. Halei*, of the southeastern and southwestern Coastal Plains, respectively, are set apart by the large, usually green bracteoles near the middle of the pedicels (It is possible that *L. flaccidifolia* is only a habitat form: cf. discussion under this species). Both show an increase in flower size from the *spicata* complex, and there is a tendency for the corolla to become fenestrate. The leaves in *L. Halei* (Fig. 24) may be rather bunched near the base of the stem, as is sometimes seen in *L. spicata* var. *hirtella*.

In *L. floridana* this reduction of leaves has gone further, so that they are nearly all basal; the prominent auricles of *L. Halei* have vanished, and the bracteoles are inconspicuous. This is a species mostly (so far as known) of the Gulf States, from west Florida westward along the coast. It is also known from Wilmington, N. C. (Fig. 25).

Apparently the most advanced of this sub-group is *L. paludosa*, which has developed in peninsular Florida, and west about to the Apalachicola River. The leaves are entirely basal, there are no bracteoles on the pedicel, and the corolla has become plainly fenestrate (Fig. 26).

e) This sub-group is a rather composite one, based in part upon the patently artificial character of size; the species seem, however, to agree well in seed characters (Plate 435).

In the first place, *L. Cardinalis* is a wide-spread species, very different in form of flower, as well as in color, from other North American ones; its color suggests Mexican affinities (although parallel development in the case of color is not by any means rare), as does the fact that it is represented throughout the Southwest by the plants passing as *L. splendens* Willd. (Fig. 4) and *L. fulgens* Willd. Its recent spread in this country may well have been, nevertheless, from the Appalachian region, where it is now common (Fig. 3).

The second species, *L. siphilitica*, is abundant in the Appalachian region, but has not spread to any extent into the Coastal Plain, nor far northeast into glaciated country. It has, however, migrated westward as the var. *ludoviciana* (FIG. 6), as far as Colorado. In Wisconsin and Minnesota, southward through Missouri, many intermediates appear; the typical form is not uncommon in the Ozark region (FIG. 5).

What passes for *L. amoena* Mx. is a much misunderstood plant of the Appalachian Mountains and Piedmont (FIG. 7). Small (*71*) gives this as a Coastal Plain species, which is obviously an error, probably based upon the misidentification of plants of *L. glandulifera* from Florida. The species itself is confined to the uplands, but the closely related *L. elongata* has developed in the eastern Coastal Plain (FIG. 8). The position of *L. glandulifera* Small is not wholly clear: it combines the flower-size and glandular calyx-lobes of *L. glandulosa* with the smooth corolla and general smoothness of *L. amoena.* The capsule is intermediate (where seen) between those of *L. amoena* and *L. puberula.* It seems best to regard it as a distinct species, close to *L. amoena*, perhaps also related to *L. glandulosa.* Its range is both Appalachian and Coastal Plain (FIG. 9).

f) *L. puberula* is separated from the species in the preceding subgroup because of the seeds, which seem closer to those of the *spicata* complex (PLATE 435). It has (in one of its phases) an Appalachian range (FIG. 12), almost identical with that of *L. spicata* var. *leptostachys.* This is evidently the ancestral type; it grades freely into several forms: one on the Atlantic Coastal Plain (FIG. 13), in which development has been in the direction of a hirsute calyx, large and leafy bracts, broad calyx-lobes and obtuse leaves. Southward the species becomes nearly smooth (Alabama, Mississippi); from Florida little material has been seen, but it seems to approximate the Appalachian type or that of the Atlantic seaboard. Westward and southward (Louisiana, Texas, to Arkansas) the species grades into the form with strongly dentate leaves, large long bracts, but rather smooth calyx. In other words, the Appalachian or central type of *L. puberula* seems to pass into several forms which radiate, as it were, from a central one.

The two remaining species, *L. brevifolia* and *L. glandulosa,* are closely related to each other, as shown by flower-structure. The common ancestor, if any, is, however, very much in doubt. The most

probable suggestion seems to be that both have been evolved from a plant related to *L. puberula;* all have a similar type of pubescence on the calyx, besides the fact that a number of plants have been seen which resemble hybrids of *L. puberula* and *L. brevifolia,* which may indicate relationship.

Probable Relations of Species

It seems well at this point to discuss the features of this part of the genus *Lobelia* which seem important as indicators of relationship, as well as those characters which appear to be primitive or advanced.

A. indicators of relationship.

1. Seeds. So far as can be determined, this is the most important single character. Species like *L. Kalmii* and *L. Nuttalli,* which were confused by the earlier botanists, and considered closely related, are separated by several good characters and are evidently not very closely connected. The seed-differences alone, in this case, are so striking as to make this obvious (Plate 435).

2. Pubescence of Corolla. The loose or dense mat of hair at the base of the lower lip in many species, considered in conjunction with other corolla-characters, is often of great help in taxonomy of the group. For example, *L. Canbyi,* long considered close to *L. Nuttalli* because of similar habitat and manner of growth, has the hairy lip and flower-structure of the *spicata* complex.

3. Other Corolla-Characters. Size of corolla is a weak character, in general, as is the degree of external pubescence; this applies as well to the size and degree of pubescence of the stamens. However, the lengths of the corolla, anther-tube, and filament-tube are all very constant in the same species within small limits, and often serve as good specific indicators when used with other characters. Fenestrate corollas have appeared separately in several groups (including the Mexican *L. fenestralis* Cav.), so that this is of general importance only.

4. Calyx-Characters. General shape of calyx and degree of inferiority of capsule are of considerable importance, but too much stress should not be placed upon them, as they vary even between different flowers of the same plant. The general form of the calyx-lobes is to be considered, but their length is very variable (width also), and the presence or absence of glandular teeth is not a constant character. The presence of auricles at the base of the calyx-lobes is

evidently an ancestral character which has persisted without any apparent correlation with other features.

5. Pubescence. The absolute amount of pubescence present is so variable in the same species that it makes little difference, but the character of this pubescence is in some cases important. For example, in the sub-group of *L. spicata* and its relatives, the base of the stem is densely short-pubescent. In some forms of *L. puberula* there is found very nearly the same type of hairiness, which is further evidence of the relation suggested by similarities in range and in seed-characters. Furthermore, certain plants found in Arkansas and Oklahoma are to be distinguished from *L. spicata* only by the fact that the stem is slightly hirsute in lines only, just as in *L. appendiculata.*

6. Leaf-Characters are so easily influenced by environment that they are relatively of little importance. The best example of this is furnished by *L. Kalmii*, in which the leaves vary from linear-filiform to broad elliptic, depending on the habitat.

7. Inflorescences and Branching. Most of our species have a definite central axis with subordinate lateral branches, but the degree of branching is sometimes helpful.

B. ADVANCED OR PRIMITIVE CHARACTERS.

1. Plants with leaves all cauline are considered more primitive in this respect than those with basal rosettes only; the latter all possess vestigial cauline bracts, which in some cases develop into leaves.

2. The same reasoning applies to the bracteoles usually found on the pedicel. It seems logical to assume that they are the remains of more or less leafy bracts, and are gradually disappearing; this is confirmed by their absence in such highly specialized species as *L. Dortmanna* and *L. paludosa.*

3. The Occurrence of Auricles. In general, this is probably a primitive character, in respect to this group. This is confirmed by their presence in forms like *L. spicata* var. *leptostachys*, *L. puberula*, and *L. Halei*, and their subsequent loss in related and obviously derivative plants such as *L. spicata* var. *originalis*, *L. floridana*, etc.

4. Separation of Petals from the Corolla-tube. The condition of a "fenestrate" corolla seems to be an advanced one. If, as is now mostly accepted by taxonomists, freedom of flower-parts is a primitive condition, then the corolla-tube of *Lobelia* must have come from once separate petals. It is hard to see how the fenestrate condition could have arisen without the tube once having been entire (FIG. 1). The

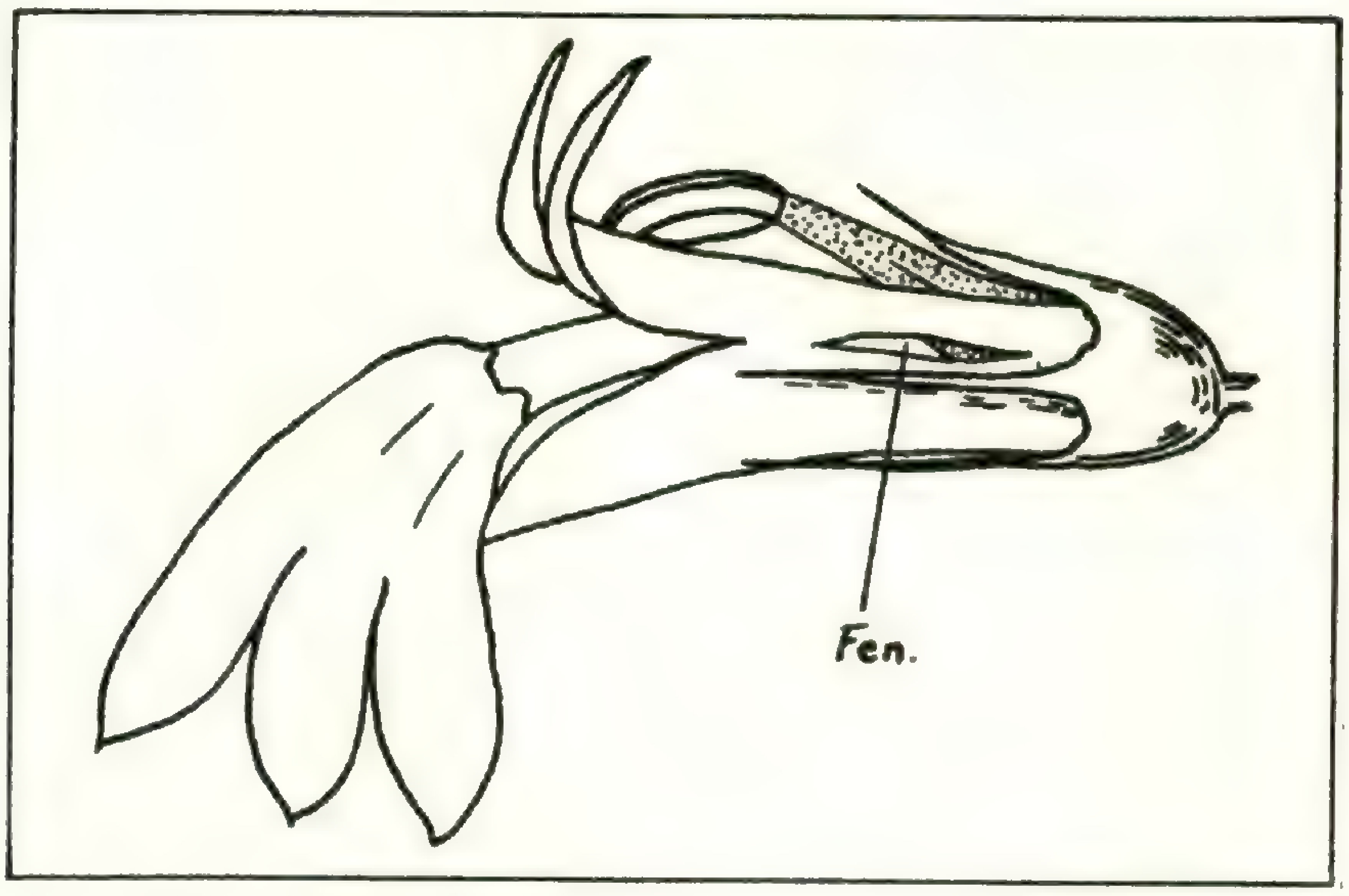

FIG. 1. Flower of LOBELIA, showing Fenestration.

same is true for the filament-tube, but this has split apart at the base in all the species, so that it is of practically no use as a taxonomic character.

5. Size. Larger flowers are probably, but not necessarily, usually more advanced; the large-flowered group shows more diversity in form of flowers than do the others, and is usually accompanied by a fenestrate corolla, both of which features indicate advance.

With the above statements in mind, as well as the geographical evidence already presented, we are able to visualize a possible ancestral plant which existed in North America in Cretaceous or early Tertiary time, probably in the region of the southern Appalachians. As a matter of fact, there may have been several ancestral types: excluding *L. Dortmanna* and *L. Kalmii*, which were apparently separated from the rest of the group much earlier, there are two main lines, which may be designated roughly as the small-flowered and the large-flowered.

In the latter, *L. Cardinalis* is a distinct individual, and has perhaps existed unchanged since Tertiary times. The same may be said of *L. siphilitica*, while *L. amoena*, *L. elongata* and *L. glandulifera* may well have come from a common ancestor.

The small-flowered species seem to have come from a plant with flowers near those of *L. spicata* in size, non-fenestrate corolla with hairy lower lip, single racemose inflorescence, auricles on the calyx-lobes, and broad, cauline leaves. This early diverged into two lines; one of these developed large flowers and a fenestrate corolla, without

the hairy lower lip (*L. puberula* and its allies). This line is a possible source of *L. glandulosa* and *L. brevifolia.* The second line failed to

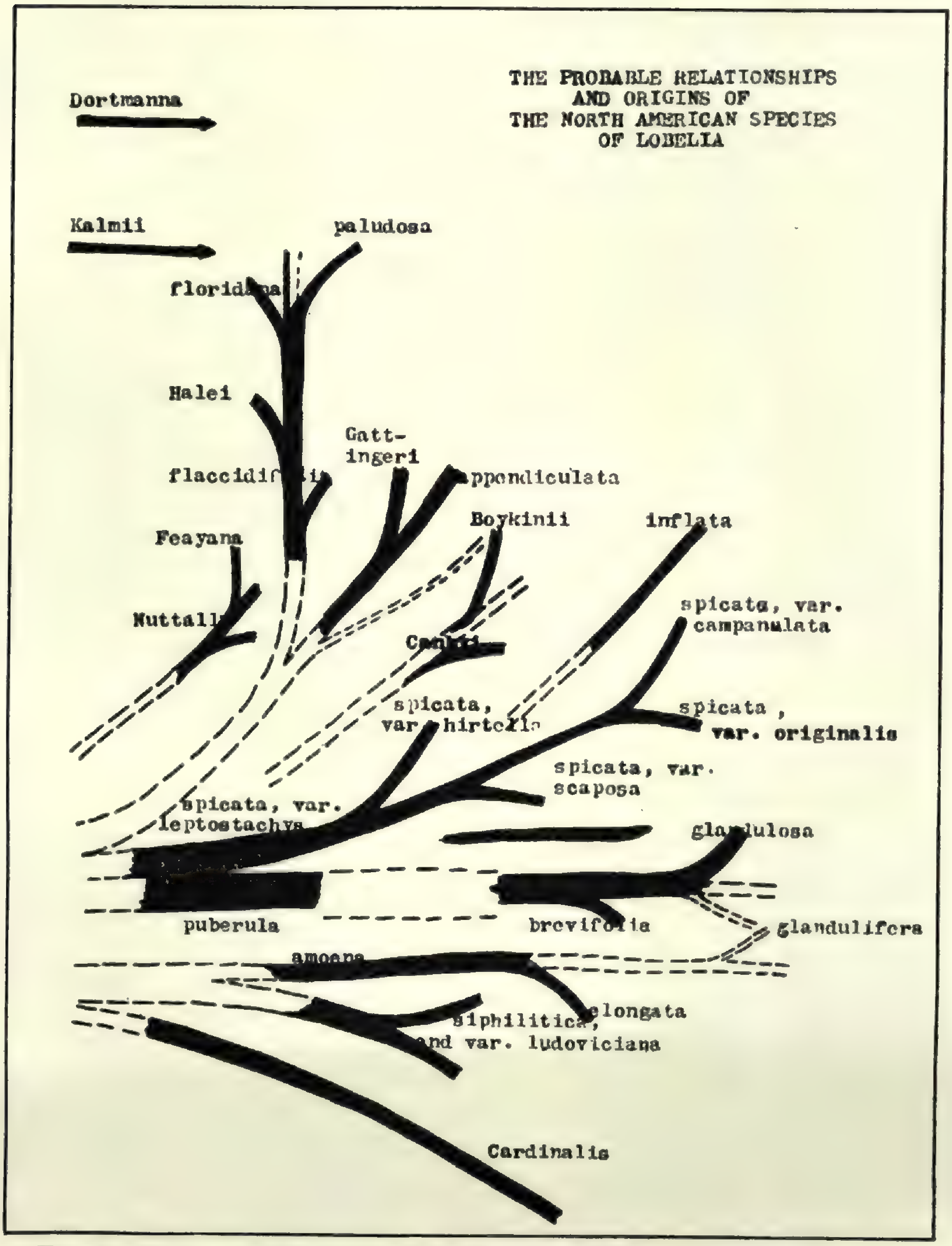

FIG. 2. Diagram of Probable Relationships of North American Species of LOBELIA.

develop large corollas, but branched out in several ways (FIG. 2). The forms of *L. spicata* make up one branch, a second being formed by

L. Gattingeri and *L. appendiculata.* A third branch is that culminating in *L. paludosa.* The line of *L. Nuttalli* and *L. Feayana* shows some resemblances in leaf and capsule to *L. spicata,* and very possibly is a minor offshoot of this complex.

Further evidence for the above, although not wholly satisfactory, is afforded by the fact that supposedly older types, such as have given rise to wide-ranging varieties and species, are confined in several cases to restricted ranges; they are not aggressive. It may be that such plants as *L. Gattingeri, L. amoena, L. spicata* var. *leptostachys,* and the Appalachian representative of *L. puberula* are old species which have passed the colonizing stage of their existence.

General Conclusions

The partly unsupported conclusion reached in this paper is that from one or more ancestral types living in the Appalachian region of the Southeastern United States, in Tertiary time or before, have come a majority of the species of Lobelia now native in this region. Secondly, that these changes have been brought about by the natural radial spread of the original species, so that closely related plants are seen to be occupying different radii of the same hypothetical circle. These relatives are usually not to be considered cases of simple linear development, but of parallel development from a common ancestor. There are several excellent cases in point:

1. The western var. *hirtella* of *L. spicata* did not come from the var. *originalis* of the eastern states, as has been assumed, but from a plant like *L. spicata* var. *leptostachys,* in a central position (*cf.* Fig. 19).

2. The Appalachian phase of *L. puberula* is replaced in the East by one derivative, and in the West by a similar but distinct one, both of which must have come from the first, as neither of the outlying ones, so far as known, occurs in between (*cf.* Fig. 20).

3. On the Coastal Plain of Florida and Georgia, west about to the Apalachicola River and the eastern edge of Alabama, occur three species; *L. glandulosa, L. paludosa,* and *L. flaccidifolia.* West of this line, their places are taken quite abruptly by *L. brevifolia, L. floridana,* and *L. Halei,* respectively: taken in each case by a closely related species. Wherry, in a geographical study of the southern Sarracenias (Mss.), finds somewhat the same situation in that genus, and assumes that these related forms have come separately from a common ancestor, along one of the many more or less parallel streams leading

out of the Appalachian region to the Coastal Plain (Figs. 10 and 11. *cf.* also Figs. 24, 25, 26).

In the foregoing the writer has attempted to show that the North American Lobelias form a distinct unit, clearly separable from geographically neighboring ones. It is true that the conclusions reached here are largely theoretical, but in reaching them every effort has been made to stay within the bounds of evidence actually at hand, and those of logic.

In the following pages is given a conspectus of the North American species, with detailed data of the plants themselves, and their ranges. No attempt has been made to give the complete synonymy for all species; only the most important references are included.

In citing herbarium specimens, one record only is given for each county, except in special cases such as large counties or districts, little-known species, or areas near the limits of ranges. For the wide-ranging and well-known species *L. Cardinalis* L., *L. siphilitica* L., *L. inflata* L., *L. Kalmii* L., and *L. Dortmanna* L. a few citations only or dots on the maps are given for each state or province. For all other species and varieties, at least one record is given for each county or district where the plant is known to have grown. Near the edges of the ranges of the above five species, all known county records from certain states have been given; in such cases the citations from that state are followed by (All).

All other things being equal, specimens with collection-numbers have been cited; likewise, those which are represented by duplicates in several herbaria. Except where noted, the ranges given at the ends of the descriptions of species have been compiled only from material actually seen.

Conspectus of the North American Species

Lobelia [Plumier] Linnaeus, Gen. Pl. 897. Ed. V. 401. 1754.

Type Species: *L. Dortmanna* L., Sp. Pl. II: 929. 1753. This is chosen as the type because it was the species best known to Linnaeus in Sweden, and was mentioned in the "Flora Lapponica."

Not *Lobelia* Plumier, Gen. 21. 1703; plate 31. (=*Scaevola* L.).

Dortmanna [Rudbeck] Linnaeus, Syst. Ed. I. 1735 (fide Index Kew.).

Lobelia Linnaeus, Gen. Pl. Ed. I. 267. 1737.

Rapuntium Tournefort, Inst. R. H. 163. 1700. Presl, Prodr. Mon. Lob. (1836).

Our species annual or perennial herbs, with acrid milky juice con-

taining more or less of an alkaloid, lobelin; leaves alternate, simple, exstipulate, usually with callose-glandular teeth. Pubescence variable, greatest near the base and near the margins of the leaves; pedicels usually pubescent or rough-puberulent. Inflorescence racemose or paniculate; usually with a main axis, and branches, if any, subordinate and developing later. Flowers perfect, 5-merous, red, purplish or blue to white; calyx-tube persistent, adnate to the ovary; corolla irregular, inserted with the stamens just where the calyx becomes free from the ovary; the lobes of the corolla mostly valvate or induplicate in the bud, the tube slit to the base between two of them (in flower the two next the axis of the inflorescence; actually the two next the bract: the reversal of position is brought about by the twisting of the pedicel in anthesis). Two petals next to the cleft often separating incompletely from the tube, from below upward, making the tube fenestrate. Limb bilabiately irregular, the three (apparently) lower lobes spreading, more or less reflexed, usually broad; the two (apparently) upper erect or recurved, usually narrow and shorter than those of the lower lip. Lower lip hairy at base in some groups, often tuberculate at base. Pedicel usually with two bracteoles near the base or above it. Stamens as many as the lobes of the corolla and alternate with them, syngenesious and partially monadelphous; anthers 2-celled, introrse, united into a tube; the two (apparently) lower smaller, with a tuft of white hairs at the tip; the three upper larger, smooth, pubescent on the backs, or tufted at tip. Filaments flat, united above from half to two-thirds their length, usually hairy below; persistent, with the anthers, in fruit. Limb of the calyx divided down to the ovary, which is wholly inferior or sometimes nearly free; calyx-lobes entire or toothed (species with normally entire calyx-lobes may have individuals with dentate lobes); lobes often with appendages at the base. Ovary 2-celled, with axial placentae, loculicidally 2-valved. Style entire; stigma 2-lobed, with a ring of hairs below the apex. Ovules numerous, anatropous. Embryo small, straight, with copious fleshy endosperm. Seeds small, roughened, foveolate-reticulate.

27 eastern North American species and varieties.

In addition, the following species (or forms usually identified as such) occur in the southern and south-western United States; they are not considered in the present paper because the larger parts of their ranges are South or Central American. None except the last belongs to the group here designated as "North American":

L. Berlandieri A. DC., *L. Cliffortiana* L., *L. Cliffortiana* L., var. *brachypoda* Gray, *L. fenestralis* Cav., *L. gruina* Cav., *L. Xalapensis* HBK., *L. splendens* Willd.

ANALYTICAL KEY TO SPECIES

1. Flowers large, straightened out 18–45 mm. long, including calyx. Corolla normally fenestrate. Terrestrial or swamp plants with leafy stems. Seeds rough-tuberculate (2).
   2. Flower crimson (white forms occurring as sports), 30–45 mm. long, including calyx (3).
      3. Anther-tube 4.0–5.5 mm. long. Filament-tube 24–33 (usually 28–30) mm. long. Leaves lanceolate to ovate-lanceolate, three times as long as wide or less, 1.5–6.0 × 6.0–18.5 cm. Smooth or sparsely hirsute-pubescent. Plants of the eastern half of the continent..1. *L. Cardinalis.*
      3. Anther-tube 3.5–4.5 mm. long. Filament-tube 19–23 (26) mm. long. Leaves lanceolate to linear-lanceolate, about seven times as long as wide, 0.4–3.0 × 5.5–21.0 cm. Smooth or sparsely pubescent. Plants of southwestern United States and Mexico..............(1) *L. splendens.* (The related rough-pubescent *L. fulgens* Willd., of Mexico, has not been seen from the United States).
   2. Flowers blue or violet (white forms occurring as sports), 18–33 mm. long (4).
      4. Filament-tube 12–15 mm. long. Calyx-lobes with broad, leafy auricles at their bases (auricles ovate-obtuse to -acute, 2–3 mm. long, not glandular-dentate). Pedicels with a pair of conspicuous bracteoles just below the calyx or ⅓–½ the length of the pedicel below it (a).
         a. Whole plant more or less hairy. Calyx and its lobes hirsute. Inflorescence usually long and dense. Leaves broad-ovate or -lanceolate, 2–6 × 6–18 cm., irregularly toothed. Plants often tall (75–100 cm.). Eastern..........................2. *L. siphilitica.*
         aa. Plant nearly smooth, usually 30–60 cm. high. Calyx and its lobes sometimes sparsely hirsute. Inflorescence shorter (6–20 flowers). Leaves smooth, lanceolate, about 1.5 × 6.0 cm., shallowly toothed or subentire. Plant of mid-western United States. ....(2) *L. siphilitica,* var. *ludoviciana.*
      4. Filament-tube 6–11 mm. long. Pedicel with a pair of bracteoles at or near the base. Auricles of the calyx present or absent (5).
         5. Calyx-lobes (usually) prominently glandular-dentate or pectinate, never hirsute. Flowers few, 3–20 (27), in loose, secund racemes. Pedicel stout, in fruit usually stiffly upright (b).
            b. Calyx-lobes pectinately toothed. Auricles broad, leafy, round, fimbriate, nearly covering the hemispheric calyx. Leaves numerous, to 200, small, narrow, obtuse, to 0.5 × 3.0 cm., prominently denticulate. Flowers 6–20, 18–20 mm. long, hairy-strigose outside. Lower lip of corolla smooth or nearly so. Filament-tube about 7 mm. long......................7. *L. brevifolia.*
            bb. Calyx-lobes prominently glandular-toothed, or nearly entire. Auricles none or very small, triangular. Flowers large, 20–33 mm. long, smooth outside, the corolla-lobes about equaling the tube in length (c).

c. Plants usually weak; leaves 5–10, long-linear, to 0.5 × 15.0 cm., usually prominently denticulate. Flowers 1–10 (15), 20–33 mm. long. Lower lip of corolla hirsute at base. Filament-tube 8–10 mm. long. Calyx often chaffy-hirsute......6. *L. glandulosa.*

cc. Plants slender or erect, smooth throughout. Leaves thick, lanceolate to oblong or ovate, to 3 × 7 cm., shallowly toothed or subentire. Flowers 6–20, 20–28 mm. long. Lip of corolla smooth. Filament-tube 7–8 mm. long....5. *L. glandulifera.*

5. Calyx-lobes (usually) entire, rarely with a few teeth, smooth or pubescent. Flowers 20–100 in often dense more or less secund racemes. Pedicels in fruit curved to one side (6).

6. Plants smooth or nearly so. Calyx-lobes narrowly linear-lanceolate, about 1 mm. broad, smooth. Auricles none or very small. Calyx campanulate in flower, becoming globose in fruit (d).

d. Leaves narrowly lanceolate, to 1.5 × 10.0 cm., acute, sharply denticulate. Filament-tube 8–11 mm. long. Anther-tube 4 mm. long. Calyx-lobes 6–13 mm. long. Species of the southeastern Coastal Plain.............4. *L. elongata.*

dd. Leaves lanceolate to broadly ovate or the lower elliptic, thin, shallowly crenate or subentire. Filament-tube 5–7 mm. long. Anther-tube 2.5–3.5 mm. long. Calyx-lobes 5–11 mm. long. Species of mountains and Piedmont, southeastern United States..............3. *L. amoena.*

6. Plants more or less short-pubescent throughout. Calyx-lobes lanceolate or broader, 2–4 mm. wide, 5–12 mm. long, ciliate-pubescent, usually more or less auriculate at the base. Calyx flat or turbinate in flower, becoming conic-hemispheric in fruit (e).

e. Flower-bracts usually leafy, broad-ovate, to 1.5 × 2.0 cm. Calyx usually densely hirsute-chaffy. Calyx-lobes broad at the base, ovate-triangular, to 4 × 12 mm., the edges much rolled back, especially in fruit, forming large rounded auricles. Leaves obovate-obtuse below, coarsely toothed, ovate above. Plant of Coastal Plain and adjoining territory, Ga. to N. J. In the region from Texas to Ark. and Mo. a similar plant with smoother calyx and strongly dentate leaves................8. *L. puberula.*

ee. Flower-bracts lanceolate, 1–2 cm. long in the lower flowers. Calyx usually pubescent, sometimes glabrate (rarely hirsute). Calyx-lobes lanceolate, to 2 × 12 mm., little rolled at the edges, even in fruit. Auricles none, or small, triangular. Leaves 10–20, oblong, acute, or obtuse below, mostly sharply denticulate. Plant of uplands, Ohio to Ga. and westward. ....8. *L. puberula.*

1. Flowers smaller, 10–22 mm. long, including calyx. Corolla normally not fenestrate (or becoming so in a few southern species). Seeds rough-tuberculate. Terrestrial or aquatic (2).

2. Plants aquatic; leaves fleshy, linear, hollow, forming a

basal rosette. Scape nearly naked, few-flowered. Anthers all densely tufted at tip. Capsules long-stalked, pendent. Occurring north of the moraine........22. *L. Dortmanna.*

2. Plants aquatic or terrestrial, leaves flat. Stems leafy or sometimes leaves nearly all radical (3).
   3. Plants with slender, more or less delicate stems and narrow leaves, seldom over 50–60 cm. high. Base of lower lip of corolla smooth (4).
      4. Flower 10–13 mm. long, calyx elongate, capsule ovoid. Pedicel with a pair of sub-opposite bracteoles about the middle. Plants of calcareous bogs and rocks, north of moraine............................21. *L. Kalmii.*
      4. Flower 7–10 mm. long. Calyx flat or conic. Bracteoles of the pedicel at its base (5).
         5. Plants 20–60 (75) cm. high, erect. Leaves lanceolate, the basal spatulate. Calyx flat; capsule hemispheric, half inferior, often bristly.......19. *L. Nuttalli.*
         5. Plants 10–30 cm. high, weak, decumbent. Leaves sub-orbicular and petiolate below. Capsule turbinate, acute at base, ⅔ or more inferior, smooth. Peninsular Florida.........................20. *L. Feayana.*
   3. Base of lower lip of corolla densely hairy or rarely nearly smooth. Plants not delicate, often tall (75–125 cm.); usually not diffusely branched. Leaves broad or sometimes linear (6).
      6. Leaves linear-lanceolate or filiform, cauline rarely 0.4 cm. wide. Inflorescence loose, mostly branched (7).
         7. Pedicels and calyx smooth. Bracteoles of pedicel none. Usually much branched above; aquatic, with leaves often deciduous, flowering May-June. ....12. *L. Boykinii.*
         7. Pedicels and calyx scabrous. Bracteoles at base of pedicel. Simple or somewhat branched, leafy; not aquatic, but living in swamps. Flower August–October.............................11. *L. Canbyi.*
      6. Leaves broad, seldom less than 1 cm. wide. Inflorescence not diffusely branched (except in *L. inflata*) (8).
         8. Calyx ovoid; capsules developing early, much inflated, ovoid, inferior. Usually much branched, especially in age. Stem usually long-hirsute...10. *L. inflata.*
         8. Plants never diffusely branched (sometimes with few subordinate side branches); inflorescence a terminal spike or raceme. Stem never long-hirsute. Capsules various, never much inflated (9).
            9. Leaves strap-shaped or oblanceolate, mostly basal. Bracteoles of the pedicel inconspicuous or none. Semi-aquatic or swamp plants of the Southern Coastal Plain (10).
               10. Plants tall, 80–100 cm. Filaments 7–9 mm. long, deflexed. Corolla-tube not fenestrate, but often with a thin place on each side of the wall. Pedicels with inconspicuous bracteoles..........................17. *L floridana.*
               10. Plants 50–60 cm. tall. Filament-tube about 3.5 mm. long. Corolla-tube fenestrate. No bracteoles visible on the pedicel........18. *L. paludosa.*
            9. Leaves mostly cauline, or, if radical, broad-ovate,

petiolate. Terrestrial plants of wet or dry places (11).

11. Pedicel with two conspicuous green bracteoles about half way up. Auricles of calyx deflexed, round, small. Plants of the southern Coastal Plain (12).
  12. Plant nearly unbranched, with thick oblanceolate or lanceolate acute leaves. Flower 19–20 mm. long, pubescent. Filament-tube 6–8 mm. long .... 16. *L. Halei.*
  12. Plant simple or branched, with thin oblong usually obtuse leaves. Flower 15–16 mm. long, nearly smooth; corolla-tube sometimes fenestrate; filament-tube 5–6 mm. long .... 15. *L. flaccidifolia.*
11. Pedicels with bracteoles at base. Auricles various (13).
  13. Stem-leaves thin, sessile with a broad base, short-ovate, nearly smooth. Basal leaves small or none. Stem nearly smooth, even at base. Raceme more or less plainly secund (14).
    14. Calyx-lobes smooth; auricles none; central Tennessee .... 14. *L. Gattingeri.*
    14. Calyx-lobes strongly glandular-ciliate. Auricles glandular-ciliate, very small or larger, foliose, scarious-tipped ... 13. *L. appendiculata.*
  13. Stem-leaves ovate or oblong to lanceolate, somewhat pubescent and narrowed at base. Stem densely short-pubescent below. Inflorescence a terminal unbranched spike, not plainly secund (15).
    15. Basal leaves large, roundish, conspicuous; the cauline 1–5, very small, bract-like. Raceme loose, nearly half the height of the plant. Auricles of calyx evident, but not long-filiform .... 9e. *L. spicata,* var. *scaposa.*
    15. Leaves mostly cauline; if basal, rarely roundish and usually with cauline leaves also present (16).
      16. Plants strongly rough-pubescent, including stem, bracts, and the long calyx-lobes. Lower bracts leafy. Plants often short (20–50 cm.), with leaves low on the stem. Auricles small or none .... 9c. *L. spicata,* var. *hirtella.*
      16. Plants smooth or pubescent, leafy, often 50–100 cm. high (17).
        17. Auricles long-filiform, deflexed, often as long as the calyx-tube. Inflorescence usually a dense narrow spike. Leaves oblong, more or less appressed. Plants sometimes ciliate .... 9a. *L. spicata,* var. *leptostachys.*
        17. Auricles very short or none. Plants usually smooth. Inflorescence a terminal raceme or spike, usually much less than half the height of the plant (18).

18. Anthers blue; calyx in anthesis flattish. Flower light blue. Raceme dense, many-flowered. Capsules short-hemispheric..... ....9b. *L. spicata*, var. *originalis*.
18. Anthers white. Calyx in anthesis roundish. Flowers dark purplish-blue. Raceme few (10–30) -flowered. Capsules globose, often somewhat inflated.......... ....9d. *L. spicata*, var. *campanulata*.

(*To be continued*)

EIGHTH REPORT OF THE COMMITTEE ON PLANT DISTRIBUTION

The present report deals with the tribes *Oryzeae, Phalarideae, Agrostideae* and *Aveneae* of the family *Gramineae,* taken in the order of the seventh edition of Gray's Manual.

The data for these reports is compiled chiefly from the Gray Herbarium and the herbaria of the New England Botanical Club, the Connecticut Botanical Society, The Boston Society of Natural History, Yale University and Brown University, supplemented by such other sources as are, from time to time, accessible. In the present report the ranges of some recent segregates, particularly in the genus *Agrostis,* have been made up solely from the material in the first two collections mentioned; these ranges may be modified in some details when it becomes possible to consult other herbaria.

We are, as always, indebted to various members of the New England Botanical Club for cordially given aid, and in this instance especially to Mr. A. H. Norton of the Portland Society of Natural History for a carefully prepared list of stations for Maine grasses. We are also repeatedly indebted to the authorities of the various institutions mentioned above for the privilege of consulting the herbaria under their care.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS—XXXIII.

The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
I. ORYZEAE						
Leersia oryzoides (L.) Sw.	+	+	+	+	+	+
Leersia oryzoides f. glabra A. A. Eaton	+		+	+		

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
I. Oryzeae—(*Cont.*)						
Leersia oryzoides f. inclusa (Wiesb.) Dörfler		+	+	+	+	+
Leersia virginica Willd.	+	+	+	+	+	+
Zizania aquatica L.	+		+	+	+	+
Zizania aquatica var. angustifolia Hitchc.	+	+	+	−		+
II. Phalarideae						
Anthoxanthum aristatum Boiss.	+	+		+		
Anthoxanthum odoratum L.	+	+	+	+	+	+
Hierochloe alpina (Sw.) R. & S.	+	+	+			
Hierochloe odorata (L.) Wahlenb.	+	+	+	+	+	+
Hierochloe odorata f. Eamesii Fern.						+
Phalaris arundinacea L.	+	+	+	+	+	+
Phalaris arundinacea f. variegata (Parn.) Druce	+	+	+	+	+	+
Phalaris canariensis L.	+	+	+	+	+	+
III. Agrostideae						
Agrostis borealis Hartm.	+	+	+			
Agrostis borealis f. macrantha (Eames) Fern.		+				
Agrostis borealis var. americana (Scribn.) Fern.	+	+				
Agrostis canina L.	+			+	+	+
Agrostis elata (Pursh) Trin.				+		
Agrostis hyemalis (Walt.) BSP.				+	+	
Agrostis perennans (Walt.) Tuckerm.	+	+	+	+	+	+
Agrostis perennans var. aestivalis Vasey	+	+	+	+	+	+
Agrostis scabra Willd.	+	+	+	+	+	+
Agrostis scabra f. Tuckermani Fern.		+		+		
Agrostis spica-venti L.	+		+	+		+
Agrostis stolonifera L.	+	+	+	+	+	+
Agrostis stolonifera f. aristigera Fern.					+	
Agrostis stolonifera var. compacta Hartm.	+	+	+	+	+	+
Agrostis tenuis Sibth.	+	+	+	+	+	+
Agrostis tenuis f. aristata (Sincl.) Wieg.	+	+	+	+	+	+
Alopecurus aequalis Sobol.	+	+	+	+		+
Alopecurus geniculatus L.	+	+	−	+	+	+
Alopecurus myosuroides Huds.				+	+	
Alopecurus pratensis L.	+	+	+	+	+	+
Ammophila breviligulata Fern.	+	+	−	+	+	+
Aristida basiramea Engelm.	+	+				
Aristida dichotoma Michx.	+	+	+	+	+	+
Aristida longespica Poir. var. geniculata (Raf.) Fern.		+	+	+	+	+
Aristida oligantha Michx.				+		
Aristida purpurascens Poir.				+	+	+
Aristida tuberculosa Nutt.				+		+
Brachyelytrum erectum (Schreb.) Beauv.	+	+	+	+	+	+
Calamagrostis canadensis (Michx.) Beauv.	+	+	+	+	+	+
Calamagrostis canadensis var. Macouniana (Vasey) Stebbins		+		+		+
Calamagrostis canadensis var. robusta Vasey	+	+	+			
Calamagrostis canadensis var. scabra (Presl) Hitchc.		+	+			

III. Agrostideae—(*Cont.*)	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Calamagrostis cinnoides (Muhl.) Bart.	+	+	−	+	+	+
Calamagrostis epigejos (L.) Roth var. georgica (Koch) Ledeb.				+		
Calamagrostis inexpansa Gray var. novae-angliae Stebbins	+	+	+			
Calamagrostis inexpansa var. brevior (Vasey) Stebbins		+	+			
Calamagrostis neglecta (Ehrh.) G., M. & S.	+		−			
Calamagrostis perplexa Scribn.	+					
Calamagrostis Pickeringii Gray		+	+	+		
Calamagrostis Pickeringii var. debilis (Kearney) F. & W.	+	+		+		
Calamagrostis Pickeringii var. lacustris (Kearney) Hitchc.		+	+			
Cinna arundinacea L.	+	+	+	+	+	+
Cinna latifolia (Trev.) Griseb.	+	+	+	+		+
Gastridium australe Beauv.	+			+		
Heleochloa schoenoides (L.) Host				+		
Mibora minima (L.) Beauv.				+		
Milium effusum L.	+	+	+	+		+
Muhlenbergia capillaris (Lam.) Trin.				+		+
Muhlenbergia foliosa (R. & S.) Trin.	+	+	+	+	+	+
Muhlenbergia foliosa f. ambigua (Torr.) Wieg.	+	+	+	+		+
Muhlenbergia foliosa var. setiglumis (Wats.) Scribn.	+					
Muhlenbergia mexicana (L.) Trin.	+	+	+	+	+	+
Muhlenbergia mexicana f. commutata (Scribn.) Wieg.	+			+		+
Muhlenbergia racemosa (Michx.) BSP.	+	+	+	+	+	+
Muhlenbergia Richardsonis (Trin.) Rydb.	+					
Muhlenbergia Schreberi J. F. Gmel.		+	+	+	+	+
Muhlenbergia sobolifera (Muhl.) Trin.		+	+	+	+	+
Muhlenbergia sobolifera f. setigera (Scribn.) Deam			+			
Muhlenbergia sylvatica Torr.	+	+	−	+	+	+
Muhlenbergia tenuiflora (Willd.) BSP.		−	+	+	+	+
Muhlenbergia uniflora (Muhl.) Fern.	+	+	+	+	+	+
Oryzopsis asperifolia Michx.	+	+	+	+	+	+
Oryzopsis canadensis (Poir.) Torr.	+	+		−		
Oryzopsis racemosa (Sm.) Ricker	+	+	+	+	+	+
Oryzopsis pungens (Torr.) Hitchc.	+	+	+	+	+	+
Phleum alpinum L.	+	+				
Phleum pratense L.	+	+	+	+	+	+
Polypogon monspeliensis (L.) Desf.	+	+		+		+
Sporobolus asper (Michx.) Kunth			−	+	+	+
Sporobolus clandestinus (Spreng.) Hitchc.						+
Sporobolus cryptandrus (Torr.) Gray	+	+		+		+
Sporobolus heterolepis Gray						+
Sporobolus interruptus Vasey	+					
Sporobolus neglectus Nash	+	+	+	+		+
Sporobolus vaginiflorus (Torr.) Wood	+	+	+	+	+	+
Sporobolus vaginiflorus var. inaequalis Fern.	+	+	+	+		
Stipa avenacea L.				+	+	+
Stipa comata Trin. & Rupr.					+	

IV. Aveneae	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Aira caryophyllea L.		+		+		
Arrhenatherum elatius (L.) Beauv.	+	+	+	+	+	+
Arrhenatherum elatius var. nodosum (Reichenb.) Hubb.				+		
Arrhenatherum elatius var. nodosum f. striatum Hubb.				+		
Avena fatua L.	+	−	+	+		+
Avena hirsuta Moench				+		
Avena hybrida Koch				+		
Avena orientalis Schreb.				+		
Avena pubescens Huds.			+			+
Corynephorus canescens (L.) Beauv.				+		
Danthonia compressa Aust.	+	+	+	+	+	+
Danthonia spicata (L.) Beauv.	+	+	+	+	+	+
Danthonia spicata var. longipila Scribn. & Merr.	+	+		+		
Deschampsia atropurpurea (L.) Beauv.	+	+	−			
Deschampsia caespitosa (L.) Beauv. var. glauca (Hartm.) Lindm.	+	+	+	+		+
Deschampsia caespitosa var. parviflora (Thuill.) Richt.	+			+		+
Deschampsia elongata Munro	+			+		
Deschampsia flexuosa (L.) Trin.	+	+	+	+	+	+
Holcus lanatus L.	+	+	+	+	+	+
Koeleria cristata (L.) Pers.	+		+			
Sphenopholis nitida (Spreng.) Scribn.				+	+	+
Sphenopholis obtusata (Michx.) Scribn.	+	+	+	+		+
Sphenopholis obtusata var. lobata (Trin.) Scribn.	+			+		+
Sphenopholis obtusata var. pubescens (Scribn. & Merr.) Scribn.						+
Sphenopholis pallens (Spreng.) Scribn.	+	+	+	+		+
Sphenopholis pallens var. major (Torr.) Scribn.	+	+	+	+		+
Sphenopholis pensylvanica (L.) Hitchc.		−		+	+	+
Trisetum melicoides (Michx.) Vasey	+	+	+			
Trisetum melicoides var. majus (Gray) Hitchc.	+		−			
Trisetum flavescens (L.) Beauv.				+		
Trisetum spicatum (L.) Richter var. molle (Michx.) Beal	+	+	+	+		+
Trisetum spicatum var. pilosiglume Fern.	+	+	+			

The report of *Danthonia sericea* from Easthampton, Massachusetts, in Stone's "Plants of Franklin, Hampshire and Hampden Counties" is, no doubt, erroneous. According to the determinations of Mr. Bayard Long, who has recently restudied the group, the New England specimens referred by St. John (Rhodora xix. 167) to *Alopecurus geniculatus*, var. *ramosus*, belong to the typical form of the species.

Anthoxanthum aristatum and *Alopecurus myosuroides* are older names for *A. Puelii* and *A. agrestis* respectively. For explanation of other names in the above list which are not to be found in Gray's

Manual, or whose application has been shifted, the following references may be consulted: Fassett, RHODORA xxvi. 153 (*Zizania*); A. A. Eaton, RHODORA v. 118, Dörfler, Herb. Norm. cent. lv, lvi. 164 (1915), and Fogg, RHODORA xxx. 84 (*Leersia*); House, N. Y. State Mus. Bull. ccliv. 87 (*Phalaris arundinacea*, f. *variegata*); Fernald, RHODORA xix. 152 (*Hierochloe*); Hitchcock, Cont. Nat. Herb. xxii. 538 and Fernald, RHODORA xxxv. 318 (*Aristida longespica*); Scribner, RHODORA ix. 17, Wiegand, RHODORA xxvi. 1, and Fernald, RHODORA xxvii. 11, Deam, Publ. Indiana Dept. Conserv. lxxxii. 163 (*Muhlenbergia*); Malte, Ann. Rep. Nat. Mus. Canada 1926. 105 and Fernald, RHODORA xxxv. 204 (*Agrostis*); Fernald, RHODORA xxxv. 108 (*Sporobolus*); Fernald, RHODORA xxvi. 196 and xxxii. 221 (*Alopecurus aequalis*); Stebbins, RHODORA xxxii. 35 (*Calamagrostis*); Hitchcock, Am. Journ. Bot. xxi. 135 (*Calamagrostis canadensis*, var. *scabra*); Fernald, RHODORA xxii. 71 (*Ammophila*); Fernald, RHODORA xviii. 195 (*Trisetum*); Fernald, RHODORA xxviii. 152 (*Deschampsia*); Hubbard, RHODORA xviii. 234 (*Arrhenatherum*); Scribner & Merrill, Circ. U. S. Dept. of Agric. xxx. 7 (*Danthonia spicata*, var. *longipila*).

Of the less common introduced species in our list, *Anthoxanthum aristatum* has been found at Randolph and Berlin, New Hampshire, at three stations in the vicinity of Boston, and on Martha's Vineyard; *Stipa comata* at Pawtucket, Rhode Island; *Heleochloa schoenoides* on made land at South Boston (*Rich*, 1888, and several later collectors); *Gastridium australe* at North Berwick, Maine, Lowell, Billerica and Boston, Massachusetts; *Mibora minima* at Plymouth, Massachusetts; *Calamagrostis epigejos*, var. *georgica* at Harwich and Gloucester, Massachusetts; *Aira caryophyllea* at Red Hill, New Hampshire and on Cape Cod and Nantucket; *Deschampsia elongata* and *Sporobolus interruptus* at North Berwick, Maine; *Koeleria cristata* at York, Maine, and Charlotte, Vermont; *Corynephorus canescens* at Edgartown, Martha's Vineyard (*Bicknell*); *Avena hirsuta* on dumps at South Boston; *A. hybrida* at Newburyport, Massachusetts (*Williams*); *A. orientalis* on Nantucket (*Churchill*); *A. pubescens* at Charlotte, Vermont, and Woodbury, Connecticut.

Trisetum flavescens is said to have been introduced with grass-seed in the Connecticut valley in Massachusetts (*Stone*) and has been found at Harwich, Massachusetts (*Fernald*).

Geographically, the groups here considered show no such preponderance of southern species as those treated in our preceding report

(Rhodora xxxi. 106–118). On the contrary, their ranges are rather evenly divided between northern and southern. Nor do they offer any taxonomic or nomenclatural difficulties comparable to those in the *Paniceae*. No new geographic groups are here recognized; the species considered fall into the following, used and defined in previous reports. As usual, varieties and forms which seem to have no geographic significance for our area are omitted.

I. Generally distributed.—*Agrostis perennans* and var. *aestivalis, A. scabra, A. stolonifera, A. tenuis, Calamagrostis canadensis, Danthonia spicata, Deschampsia flexuosa, Leersia oryzoides, Muhlenbergia mexicana, M. racemosa, M. uniflora, Phalaris arundinacea.*

Of the species here included, *Muhlenbergia uniflora* is not reported from Nantucket or Martha's Vineyard. *Muhlenbergia racemosa* and *Phalaris arundinacea* are absent from extreme eastern Maine, occur on Cape Cod only in the western townships and are not known on Nantucket or Martha's Vineyard. No specimen of *Agrostis perennans*, var. *aestivalis* from Washington County, Maine, has been seen by us, though the variety occurs on Mt. Desert and Grand Manan. *Muhlenbergia mexicana* is not known from eastern Maine or near the coast east of the Kennebec and is distinctly rare northward; its range is transitional to group VII. The other species are of literally general distribution.

II. Rather general except in southeastern Massachusetts.—*Alopecurus aequalis, Brachyelytrum erectum, Deschampsia cespitosa*, var. *glauca, Muhlenbergia foliosa, Oryzopsis asperifolia, Sphenopholis pallens.*

Sphenopholis pallens is not known from near the coast east of Casco Bay, nor has it been reported from Rhode Island. *Muhlenbergia foliosa* occurs at Crawford in eastern Maine; we have seen no specimens of it from any other point east of the Penobscot valley. *Alopecurus aequalis* occurs in Washington Co., Maine, but is not known to us near the coast from that point to southern New Hampshire, nor has it been found in Rhode Island. *Deschampsia cespitosa*, var. *glauca*, because of its riparian habitat, is somewhat local, but its general distribution would seem to place it in this group. It is absent from Rhode Island.

III. Northern.—*A. Cinna latifolia, Trisetum spicatum*, var. *molle, B. Calamagrostis canadensis*, var. *robusta, C. inexpansa*, var. *novae-angliae, C. neglecta, Muhlenbergia folliosa*, var. *setiglumis, M. Richardsonis, Oryzopsis canadensis, Trisetum melicoides.*

Oryzopsis canadensis has a peculiar distribution—a single station on the upper St. John and several along the Maine coast and in the valleys of the Androscoggin and Saco. *Calamagrostis neglecta* and *Muhlenbergia Richardsonis* are known only from extreme northern Maine and from one more southern station each—Bethlehem, New Hampshire (*Pease*) for the former and Winslow, Maine (*Norton*) for the latter.

IV. Alpine or montane.—*Agrostis borealis, Calamagrostis canadensis,* var. *scabra, C. inexpansa,* var. *brevior, Deschampsia atropurpurea, Hierochloe alpina, Phleum alpinum, Trisetum spicatum,* var. *pilosiglume.*

V. Rather general except northern Maine.—*Cinna arundinacea, Danthonia compressa, Oryzopsis pungens.*

None of the above species reaches Washington County, Maine. *Danthonia compressa* is unreported near the Maine coast; inland it extends to Moosehead Lake and the vicinity of Millinocket. It is not known from Nantucket or Martha's Vineyard. *Cinna arundinacea* and *Oryzopsis pungens* are also absent from northern New Hampshire and much of northern Vermont. As usual, through such ranges, this group grades off gradually into group VII.

VI. Neither northern Maine nor southeastern Massachusetts.—(a) *Muhlenbergia sylvatica;* (b) *Leersia virginica, Oryzopsis racemosa.*

No very definite lines can be drawn among groups V, VI and VII. The ranges of the species here put into the first two are alike in that they have too many stations in Vermont and New Hampshire (at least in the lowlands of those states) to be properly placed in group VII; but in Maine they show much variation and could be divided into a number of gradually receding subgroups. Thus, the members of what might be called group A are general in Maine south of the 45th parallel and often have outlying stations to the north of it. *Juniperus communis,* var. *depressa* is an example. Those of group B, though reaching Washington County, are not on the coast east of the Kennebec; *Athyrium thelypteroides,* for instance. C does not extend east of the Penobscot or Mt. Desert (*Ophioglossum vulgatum*). D, in addition, is absent from the vicinity of the coast east of the Kennebec. and tends to become generally more local (*Andropogon furcatus*). Species of E are rare anywhere in Maine, but do reach, at least at scattered stations, as far as the Kennebec valley. Similarly, group VII shows large variation within its limits, as the discussions in this and other reports show.

The three groups here recognized are, then, admittedly loose and somewhat arbitrary; perhaps, for the greatest accuracy, a considerable series of such minor groups as those outlined above ought to be distinguished. We have hesitated to do so until we had accumulated more data than the few reports so far prepared have given us. The larger groups we have used are predicated on the geographic importance of the well-marked floras of southeastern Massachusetts and of the St. John and Aroostook valleys in northern Maine and on the tendency of a large number of species to stop, northward, at about the northern boundary of Massachusetts. *Oryzopsis racemosa* is placed in group VI rather than in VII because of the comparatively large number of stations for it in Vermont and New Hampshire and because of its occurrence in the Kennebec valley; *Leersia virginica*, almost wholly because of its stations along the Kennebec. The distinction between its range and that of *Sporobolus vaginiflorus* is not great; it does appear to us the most practicable we can make.

VII. Chiefly the three southern states.—*Aristida dichotoma, A. longespica*, var. *geniculata, A. purpurascens, Calamagrostis cinnoides, Muhlenbergia capillaris, M. Schreberi, M. sobolifera, Sphenopholis nitida, S. obtusata, S. pensylvanica, Sporobolus asper, S. vaginiflorus, Stipa avenacea.*

Of the above species, *Aristida dichotoma, Muhlenbergia sobolifera, M. Schreberi, M. tenuiflora*, and *Sporobolus vaginiflorus* reach southern New Hampshire and the Champlain valley. Only the first and last are found on Cape Cod; both also touch southwestern Maine. *Calamagrostis cinnoides* and *Sphenopholis obtusata* likewise have extensions to southwestern Maine, but do not occur in the west as far north as Berkshire County, Massachusetts. The latter is also absent from Cape Cod. Of the species confined to the southern states, or practically so, *Sphenopholis pensylvanica, Aristida purpurascens* and *A. longespica*, var. *geniculata* occur on Cape Cod, but not in Berkshire County. *S. nitida* is found in Berkshire County, but not on Cape Cod. The others occur in neither area. *Stipa avenacea* is found chiefly near the coast.

VIII. Calcicolous (northern).—*Milium effusum.*

IX. Maritime.—*Ammophila breviligulata, Aristida tuberculosa, Sporobolus cryptandrus.*

X. Miscellaneous.—*Agrostis elata, A. hyemalis, A. stolonifera*, var. *compacta, Aristida basiramea, Calamagrostis perplexa, C. Picker-*

ingii, Danthonia spicata, var. *longipila, Hierochloe odorata, Sporobolus clandestinus, S. neglectus, S. vaginiflorus*, var. *inaequalis, Zizania aquatica* and var. *angustifolia*.

Agrostis hyemalis (*A. antecedens* Bickn.) has a coastal plain distribution in the eastern United States, but in the Mississippi Basin extends north to Illinois and west to Kansas and Oklahoma. *A. stolonifera*, var. *compacta* is most common along the coast, but has various scattered stations inland, particularly in Maine. *Calamagrostis Pickeringii* is confined to two small areas, in the White Mountain region of New Hampshire and the lower Merrimac valley in that state and in Massachusetts. *Hierochloe odorata* combines, curiously, a maritime with a calcicolous range; it could pass as generally distributed except for its absence from large acid-soil areas in central and western Massachusetts and southern New Hampshire. *Sporobolus neglectus* occurs in the calcareous region of western New England, close to the boundary, from the Champlain valley to southern Connecticut, and at an isolated station in the valley of the Aroostook River in Maine. *Sporobolus vaginiflorus*, var. *inaequalis* is almost wholly confined between the northern boundary of Massachusetts and the forty-fifth parallel, a range very like that of *Alisma Plantago-aquatica. Zizania aquatica*, var. *angustifolia* has a similar distribution, but pushes farther north in the Penobscot valley. Typical *Z. aquatica* is found chiefly along the lower Kennebec, in eastern Massachusetts, in the lower Connecticut valley and in the Champlain valley. The other species here placed have too few and scattered stations to be classified.

C. A. Weatherby
C. H. Knowlton
R. C. Bean.

Verbena prostrata an Invalid Name.—Not long ago, as I was glancing casually over a bibliography of Professor Gaetano Savi, the following item attracted my attention:

Verbena prostrata. Memorie della Società Italiana. T. IX, p. 349, 7 Settembre 1801.

(Questa specie presentemente porta il nome di *Verbena bracteosa* statogli dato dal Michaux nel 1803.)

Verbena prostrata Savi was a new name to me. It is not listed in the Kew Index and I had not found it while working on A Revision

of the North American Species of Verbena in Ann. Mo. Bot. Gard. xx. 239–363 (1933). Happily the earlier volumes of Memorie di matematica e di fisica della Società Italiana are at the Boston Public Library. I find that, although *V. prostrata* is undoubtedly the American plant which for many years has passed as *V. bracteosa* Michx., Savi's paper, presented for publication September 7, 1801, was not actually issued until 1802; consequently, the name *V. bracteata* Lag & Rodr. in Anal. Cienc. Nat. iv. 260 (1801) is still valid for this species. Unfortunately, however, *V. prostrata* Savi does antedate *V. prostrata* R. Br. in Ait. Hort. Kew. ed. 2: iv. 41 (1812) by ten years. Hence, it is necessary to take up the name *V. lasiostachys* Link, Enum. Hort. Berol. ii. 22 (1822) for the Californian species hitherto known as *V. prostrata* R. Br.—Lily M. Perry, Gray Herbarium.

The Color of the Flowers of Nelumbo pentapetala.—In the discussion of *Nelumbo pentapetala* (Walt.) Fern. in Rhodora for January 1934, the color of the flowers was said to be white, sometimes passing into a weak whitish yellow, so that Walter's account of them as white was as accurate as Willdenow's characterization of them as yellow. The plant grows or did grow on the Monroe marshes and covered many acres in extent. It also grows in such dense masses on the Upper Maumee Bay and neighboring waters that it may be seen for miles in either direction. The Lotus beds of the Monroe marshes were for a great many years an advertising feature of Monroe to attract tourists and visitors to that city. These have practically disappeared since Michigan put the muskrat under game protection. The rats devoured the rhizomes for food and thus destroyed one of Monroe's flourishing activities. The plants flowered by the thousands every year and visitors were taken out to the beds and allowed to cut the flowers at will and carry them away. I am putting it rather mildly when I say that in the forty years I was at Detroit I probably saw a million such flowers; but never a "white" one. The flowers in southeastern Michigan were always yellow, of a pale sulphur- or lemon-yellow. The petals were upwards of a dozen, often as many as twenty, perhaps sometimes more. If the plant of the Atlantic seaboard has white flowers we probably have two color-forms of the Lotus.—Oliver A. Farwell, Lake Linden, Michigan.

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THE NEW ENGLAND BOTANICAL CLUB

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RANGE EXTENSIONS OF CERTAIN PLANTS ON THE GASPÉ PENINSULA

John H. Pierce

At the suggestion of Dr. M. L. Fernald of the Gray Herbarium of Harvard University and Dr. David Potter of Clark University, the author and Mr. Walter H. Hodge of the Massachusetts State College spent the months of June and July, 1934, collecting in the western end of the Shickshock Mountains in Leclerq and Joffre townships, Quebec, Canada.

Since 1920 several parties have collected in the mountains east of the Cap Chat River, but before the author's trip no collecting had been done in the mountains to the west of this area. Dr. Fernald, on trips to Mt. Logan, Mt. Albert and adjacent peaks, found remotely isolated arctic, western and endemic plants indicating an area which escaped continental glaciation of the Wisconsin period.[1] The purpose of the author's trip was to see if western and endemic plants grew in the Shickshock Range west of the area covered by Dr. Fernald.

Six miles west of the Cap Chat River in Joffre township is the first mountain of any size, Mt. Bayfield (3200 ft.). This peak proved to be a botanical disappointment, since it was wooded to the top, with the typical upland Canadian flora. About five miles west of Mt. Bayfield is Mt. Blanc (3500 ft.), where we were delighted to find several exposed areas near the summit. Here on crumbling cliffs of chloritic schist we found the western, the arctic and the "relic" plants listed below. The rock substance of the cliffs was punky and readily crumbled in the fingers. The top was largely covered by an

[1] Fernald, M. L. Persistence of Plants in Unglaciated Areas of Boreal America. Mem. Am. Acad. xv., no. iii. 1925.

upland meadow with many exposed rocky areas. There were no erratics or glacial markings of any kind. These facts, together with the isolated or "relic" plants found, indicate that Mt. Blanc is another of the Shickshock Mountains with pre-glacial relics.

The range-extensions listed below are chiefly of local interest, the plants already being known from other points on the Peninsula or in neighboring areas of Quebec. One, the Ranunculus, however, has been known in eastern America, south of the arctic regions, only in northern Newfoundland.

Salix anglorum var. kophophylla Schneider. Has been known in Western Newfoundland, and on Mt. Albert in the Gaspé Peninsula. It was found on exposed cliffs of chloritic schist on the southwest summit of Mt. Blanc. No. 92.

Arenaria macrophylla Hook. Known in the far west from New Mexico to its northern limit in southern British Columbia. It grows in western Massachusetts and Vermont; and on the Gaspé Peninsula at Mont Joie and on Mount Pembroke. This plant was collected by the author on an unnamed peak at the southern end of Lake Matane, on a small exposed area near the summit. No. 114.

Cerastium Beeringianum Cham. & Schlecht. Known in western North America from Arizona to Alaska, in the east from Labrador and Newfoundland, and from the tip of the Gaspé Peninsula along the coast to Bic, also on Mt. Mattaouisse, Mt. Logan and Tabletop Mountain. This plant was collected on the southwest summit of Mt. Blanc on open cliffs of chloritic schist. No. 119.

Cerastium Fischerianum Seringe. A species chiefly of the North Pacific and Bering Sea region, in the east known from about the Gulf of the St. Lawrence. Formerly collected at Percé, on Bonaventure Island and Cape Rosier on the Gaspé Peninsula, this plant was found on the same cliffs of chloritic schist on the southwest summit of Mt. Blanc. No. 118.

Arabis Holboellii Hornem. Typically of Greenland, reaching its southern limit in eastern North America about the Gulf of the St. Lawrence. Previously found on the Peninsula at Cape Rosier, this plant was collected on an unnamed peak at the southern end of Lake Matane on a small exposed area near the summit. No. 15.

Potentilla emarginata Pursh. A species of Greenland, Arctic America, and northern Labrador, isolated southward in the Shickshock Mountains. Previously found on Mt. Logan and Mt. Mattaouisse, this plant was collected by the author on the southwest summit of Mt. Blanc on exposed cliffs of chloritic schist. No. 179.

Vaccinium ovalifolium Smith. Known in the west from Oregon, Washington and southern British Columbia north to Alaska. Also known from northern Michigan, from Newfoundland and adjacent Labrador. Formerly collected on the Gaspé Peninsula on Tabletop

Mountain, Mt. Albert, Mt. Logan, and Mt. Mattaouisse, found by the author on the southwest summit of Mt. Blanc on exposed cliffs of chloritic schist. No. 250.

Solidago multiradiata Ait. Known from Labrador, Newfoundland and Hudson Bay, and on the Gaspé Peninsula from Bonaventure Island, Mt. Albert, Tabletop, Mt. Pembroke and Mt. Fortin. It was collected by the author on the southwest summit of Mt. Blanc on exposed cliffs of chloritic schist. No. 350.

Draba nivalis Liljebl. Known from circumpolar regions, Labrador, Newfoundland and on the Gaspé Peninsula from Marten River, Mt. Mattaouisse, Mt. Fortin, and between Mt. Logan and Mt. Pembroke. This plant was found on exposed cliffs of chloritic schist on the southwest summit of Mt. Blanc. No. 145.

Carex rupestris All. A wide-ranging arctic-alpine species, which has been known on the Gaspé Peninsula from Percé, Tabletop, and Mt. Fortin. This plant was collected on the southwest summit of Mt. Blanc on open cliffs of chloritic schist. No. 401.

Carex Vahlii Schkuhr. A widely dispersed arctic-alpine species, which has been found on the Gaspé Peninsula only on Mt. Mattaouisse. It was collected on cliffs of chloritic schist on the southwest summit of Mt. Blanc. No. 400.

Ranunculus pedatifidus J. E. Smith var. leiocarpus (Trautv.) Fernald. An arctic species known southward to the mountains of northern Labrador and isolated in northern Newfoundland. This is the only record of the plant on the Gaspé Peninsula, collected on the southwest summit of Mt. Blanc on exposed cliffs of chloritic schist. No. 137.

There are many peaks about Lake Matane and in the Cap Chat valley from which we have no records of plants collected. Of these areas Mt. Frère de Nicolabert, with its exposed peak, should prove to be of interest, but whatever rare species it harbors only future trips can tell.

Specimens of the plants listed above have been deposited in the Herbarium of Clark University and in the Gray Herbarium of Harvard University.

The author is deeply indebted to Dr. David Potter for his generous advice and assistance and to Dr. M. L. Fernald for his aid in checking the entire collection.

Clark University,
Worcester, Mass.

STUDIES IN THE TAXONOMY AND DISTRIBUTION OF THE EASTERN NORTH AMERICAN SPECIES OF LOBELIA

Rogers McVaugh

(*Continued from page 263*)

1. L. Cardinalis Linnaeus, Spec. Pl. II: 930. 1753. Type Locality: "Habitat in Virginia." Type Specimen: In Linnaean herbarium in London; seen by Linnaeus before 1753. Photograph seen.—*Trachelium Americanum flore ruberrimo*, Parkinson, "Paradisus Terrestris"; 356. 1629. *Flos Cardinalis*, Rivinus, "Introductio Generalis in Rem Herbarium," with plate, 1690. *Cardinalis Rivini*,

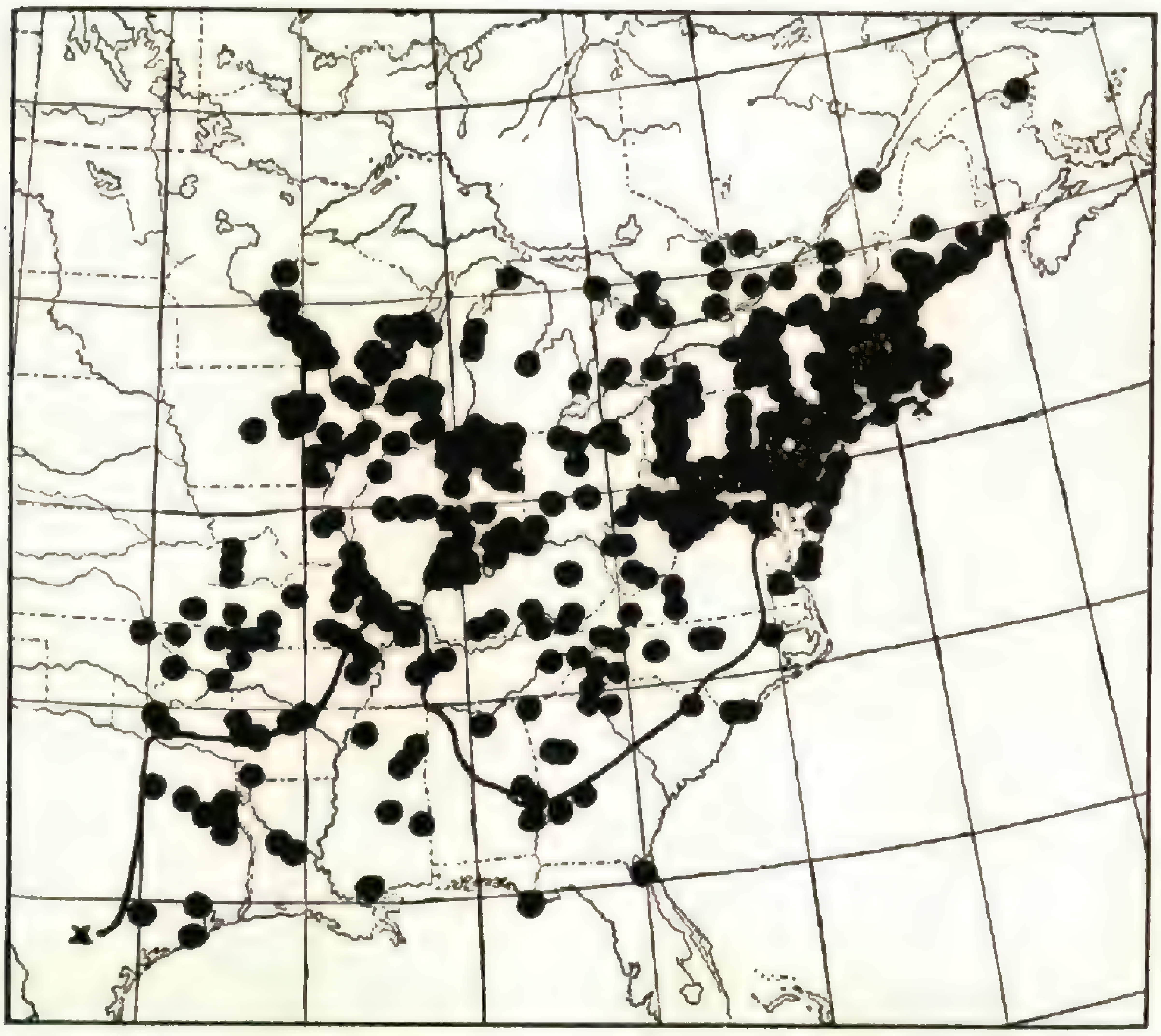

Fig. 3. Range of Lobelia Cardinalis.

Rupp, "Flora Jenensis"; 242. 1718. *Rapuntium maximum, coccineo spicato flore*, Tournefort, "Institutiones Rei Herbariae"; 163. 1719. Plate 51.—Stem erect, unbranched, coarse (sometimes 1.5 cm. in diameter at the base), green, usually dark purplish-red below, sometimes purple-flecked or purplish throughout, 40–180 cm. high, smooth or short chaffy-pubescent. Cauline leaves 10–30, spreading, thin or papery, smooth or short bristly-pubescent, sub-entire in outline, but very irregularly coarsely or finely dentate, the teeth callose-tipped;

size 1.5–4.0 (6.0) × 8–12 (18) cm., often three times as long as broad or longer; lanceolate or lance-ovate to oblong, less often ovate; usually acute at the tip, narrowed at the base, the lower short-petiolate. Perennial by offsets. Roots fibrous. Inflorescence a terminal raceme, unbranched, few–50 cm. long, not noticeably secund, densely (or loosely) few–100 flowered. Pedicels more or less upright, slender, 4–14 mm. long in fruit, short bristly-pubescent, each with a pair of bracteoles at or near the base. Flower-bracts linear or the lower lanceolate, leafy; smooth or nearly so, with prominent callose teeth, 1–5 cm. long. Calyx in anthesis conic or short-campanulate, smooth or somewhat pubescent, becoming cup-shaped or hemispheric in fruit, strongly ribbed, usually broader than high, 8–11 mm. across. Capsule about half inferior. Calyx-lobes linear-subulate, with a short-deltoid base, smooth or ciliate at the tip, 8–16 mm. long. Auricles none, or minute, triangular. Flower 30–45 mm. long, including calyx. Corolla deep crimson (pink or albino forms occur rarely), somewhat puberulent, the lip smooth. Corolla-tube fenestrate; lobes of the lower lip spreading, deflexed, ovate, acute, narrowed at the base, nearly equalling the tube, 3–5 × 13–20 mm.; the two upper lobes erect, linear, 1–2 × 13–20 mm. Filament-tube 24–33 mm. long (ave. 28–30 mm.), much exceeding the corolla-tube, red, pubescent below, connate above more than half its length. Anther-tube 4.0–5.5 mm. long, bluish-gray, the two smaller anthers white-tufted, the three larger smooth or lightly pubescent.—Coastal swamps, river banks, borders of lakes; sometimes in open swampy places; a plant of neutral soil, penetrating acid-soil and dry regions only along river systems. New Brunswick and Ontario to Minnesota, south to Texas and Florida; west of the Mississippi only along rivers (reported from Nebraska by Petersen); throughout the range, but local or absent from large areas such as the Pine Barrens of New Jersey, where conditions are unfavorable.—Flower: late July–early Sept. Fruit: mid-Aug.–Oct. The species is so definite and the range shown in such detail in the map (FIG. 3) that the citation of specimens is unnecessary.

From Kansas and Texas westward the closely related *L. splendens* Willd. is to be distinguished by the (usually) narrower leaves (sometimes narrowly linear), and by the smaller flowers (filaments 20–24 mm., rarely longer, little exceeding the corolla-tube; anther-tube 3–4 mm. long).

The following material has been seen of the closely related plant which is apparently *L. splendens* Willdenow:

MISSOURI: JACKSON: Courtney, *Bush 294* (Mo). NEBRASKA: HITCHCOCK: Culbertson, *Wagner*, Aug. 1911 (W). KANSAS: MCPHERSON: "Linsborg," *Bodin*, Jy. 1887 (M). RILEY: *Hitchcock 316a* (G, Mo, NB, R). OKLAHOMA: BLAINE: Watonga, *Stratton 481* (Mo). CLEVELAND: Norman, *Bruner*, Sep. 1924 (W). OSAGE: Pawhuska, *Stevens 1993* (G). PAYNE: Stillwater, *Waugh 259* (Mo). WOODS:

Alva, *Stevens 2836* (G, M). Texas: "between Ft. Leavenworth and El Paso," *Diffenderfer*, ann. 1871 (ANS). bell: Holland, *Mackensen 235* (Mo). bexar: San Antonio, *Bush 1256* (Mo). comal: New Braunfels, *Lindheimer*, Sep. 1850 (ANS, UP). culberson: Guadalupe Mts., *Moore and Steyermark 3513* (ANS). gillespie: *Jermy herb. 761* (Mo). oldham: "1 mi. N. Canadian R., on Amarillo-Dalhart rd.", *Ferris and Duncan 3481* (Mo, NB). wilson: Sutherland Springs, *Palmer 2090* (ANS). Colorado: yuma: Wray, *Shantz*, Sep. 1907

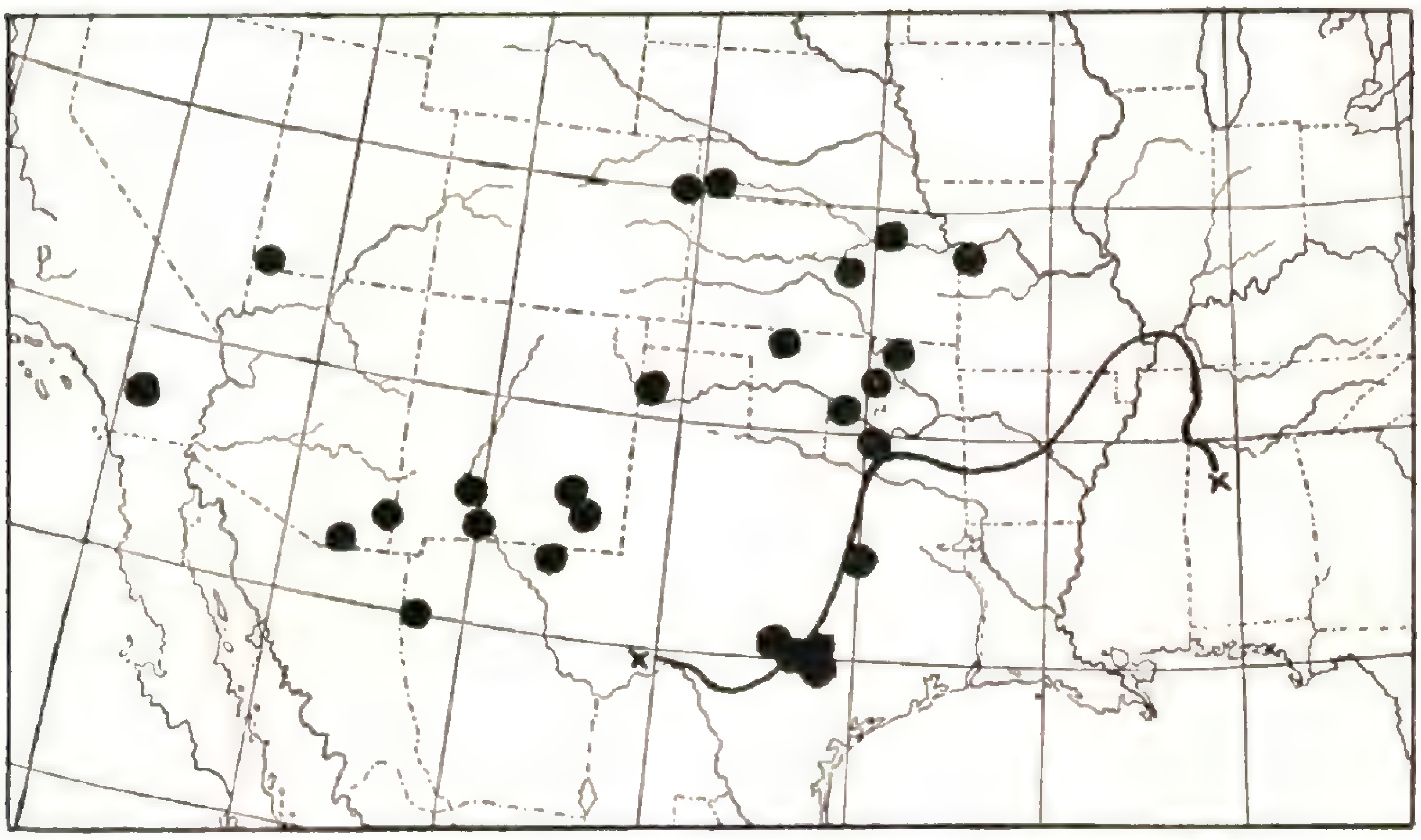

Fig. 4. Northern Extension of Lobelia splendens.

(NB). Utah: washington: Springdale, *Jones 6077* (Del, R); Zion Natl. Park, *Pilsbry*, Aug. 1925 (ANS). New Mexico: bernalillo: Albuquerque, *W. Harward* (Mo). chaves: Roswell, *Earle 497* (M). dona ana: Organ Mts., *Wooton 10644* (NB); "Donana," *Parry et al.* (Mex. Bound. Surv. 694) (ANS). lincoln: White Mts., *Wooton 202* (M, R). sierra: Kingston, *Metcalf*, Aug. 1904 (W). Arizona: cochise: Huachuca Mts., *Lemmon herb. 2806* (ANS, CM); Paradise Falls, *Blumer 1731* (W). California: san bernardino: San Bernardino Mts., *Abrams 2937* (ANS). Chihuahua: Sierra Madre, *Pringle 2287* (ANS); Cumbre, *Palmer 368* (ANS); Chuichupa, *Townsend and Barber 427* (R).

2. L. siphilitica Linnaeus, Spec. Pl. II: 931. 1753. Type Locality: "Habitat in Virginia." Type Specimen: in Linnean herbarium in London; seen by Linnaeus before 1753. Photograph seen. *Rapuntium Americanum, flore dilute caeruleo*, Dodart, "Memoires" 105. 1676 (acc. to Tournefort, Inst. R. H. 163. 1719). *Rapunculus galeatus, Virginianus, flore violaceo, majore*, Morison, "Plantarum historiae" II: 466. 1680. (This is possibly *L. puberula* Mx.). *Lobelia caule erecto, foliis ovato-lanceolatis crenatis, floribus lateralibus*, Linn-

aeus, Hort. Cliff. 426. 1737. The name "*siphilitica*" may have been suggested by Kalm (1750) (*32*). *L. antisiphilitica* Hayne, Arzn. Gewachse. XIII: plate 9. 1837.—Stem erect, unbranched, rather coarse, 20–130 cm. high, light green, quite smooth or sparsely chaffy-hirsute, especially on the angles formed by the decurrent leaf-bases. Cauline leaves few–25, usually loosely spreading, very thin and papery, the lower narrowed into margined petioles; in shape obovate, oblong, ovate or ovate-lanceolate, usually short-acute at the tip, 2.0–4.0 (6.0) × 6–12 (18) cm., nearly smooth beneath, sparingly strigose above; sub-entire in outline, or more or less coarsely serrate, the teeth callose-tipped; upper leaves usually merging gradually into the bracts of the inflorescence. Perennial by offsets. Roots fibrous, rootstock thick. Inflorescence a terminal raceme 10–30 (50) cm. long, usually densely 6–75-flowered, not secund. Pedicels loosely upright, 5–10 mm. long in fruit, more or less flattened, smoothish or chaffy-hirsute, each with a pair of conspicuous bracteoles just below the calyx or 1.5–4 mm. below. Flower-bracts smooth or somewhat ciliate-fringed, the lower (sometimes all) leafy, the upper usually smaller, lanceolate, 1–2 cm. long. Calyx in anthesis flattish-hemispheric, usually more or less chaffy-hirsute, becoming hemispheric in fruit, somewhat flattened (broader than high), 8–10 mm. in diameter. Capsule $\frac{1}{2}$–$\frac{2}{3}$ inferior. Calyx-lobes foliaceous, broad-lanceolate or ovate, acute or acuminate, often 5–6 mm. wide by 8–11 (14) mm. long, the margins usually much folded back, ciliate and serrate, undulate or crisped. Auricles foliaceous, flat, small or covering the entire calyx, obtuse or acute, sometimes connate, 2–5 mm. long. Flower 23–26 (33) mm. long, including calyx. Corolla bright blue (albino forms sometimes occur), white-striped in the throat; base of the lower lip white, with two raised tubercles; corolla smooth or hirsute on the veins outside. Corolla-tube fenestrate; lobes of the lower lip narrow-ovate, short-acute, sharply deflexed at base, about half as long as the tube, connate below or nearly to the tip: two upper lobes long-acuminate, about as long as the lower. Filament-tube 12–15 mm. long, pubescent below, connate above more than half its length, somewhat deflexed. Anther-tube 4.0–5.5 mm. long, bluish-gray, the two smaller anthers tufted, the three larger smooth.—Moist woods and swampy places; often in light shade; less frequently by streams or in open wet places; a plant of neutral or somewhat calcareous situations. Maine and southern Ontario to eastern Minnesota, south in the Mississippi Valley to Tennessee; common in the Appalachian region, south to Alabama (possibly Mississippi and Louisiana); rare or absent on the south-eastern Coastal Plain. Not common in New England. Flower Aug. 10–Sep. 20. Fruit September to mid-October. Representative material seen: ONTARIO: GREY: Hanover, *Hauch*, Jy. 1895 (W). HASTINGS: Madoc, *Ivey*, Aug. 1906 (Toronto). HURON: Wingham, *Morton*, Jy. 1890 (NB, US). MIDDLESEX: London, *Millman*, herb. G. S. Can. 15259 (O). WELLAND: Niagara Falls, *McCalla 413* (O).

york: Toronto, *Hollingsworth 1601* (Toronto). Maine: aroostook: Fort Fairfield, *Furbish*, ann. 1881 (NE). cumberland: Falmouth, *Norton 918* (NE). sagadahoc: Topsham, *Hutchins*, ann. 18—(NE). (ALL). Massachusetts: berkshire: Sheffield, *Hoffmann*, Sep. 1912 (NE). middlesex: Cambridge, "Tin Canon," introduced, *Fernald*, Sep. 1891 (G, NE). (ALL). Connecticut: fairfield: Sherman, *Winton*, Aug. 1885 (G, US). litchfield: Salisbury, *Weatherby*, Sep. 1914 (US). new haven: Derby, *Oakes*, Aug. 1828 (NB). (ALL). New York: monroe: Ontario Beach, *Bartram 1797* (ANS). st. lawrence: Stockholm, *Phelps 1752* (G). tioga: Apalachin, *Fenno*

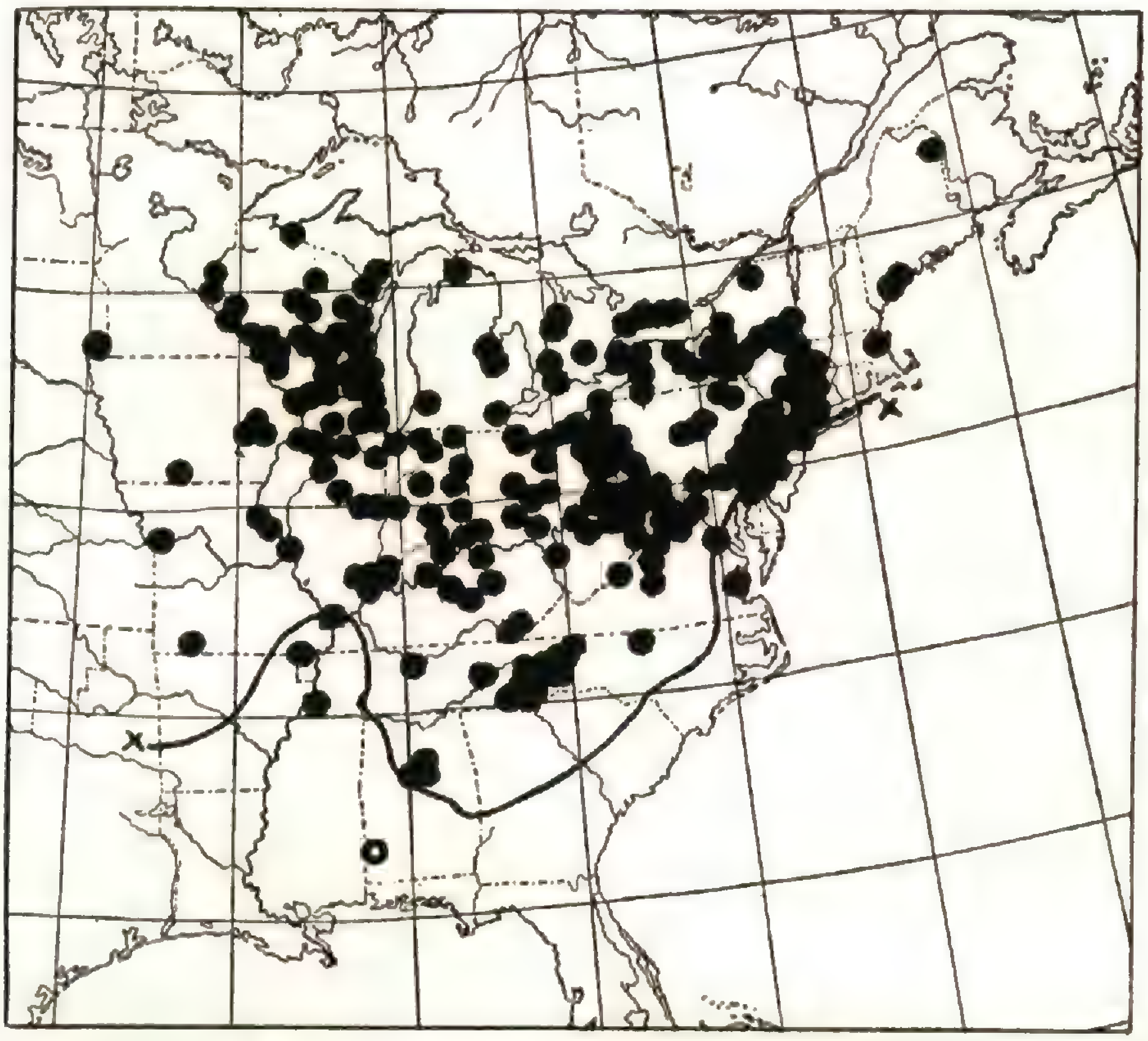

Fig. 5. Range of Lobelia siphilitica.

261 (NB). warren (?): Lake George (no county given), *Mrs. Watrous*, ann. 1895 (NB). New Jersey: burlington: Moorestown, *Hollinshead* (UP). somerset: Watchung, *Moldenke 6391* (NB). Beside the above, known only from bergen, hunterdon, sussex, warren cos. Pennsylvania: bradford: Sayre, *Barbour 966* (R). clarion: Lawsonham, *Bright 7342* (W). york: McCalls Ferry, *Heller 1280* (ANS, G, NB, US). Delaware: newcastle: Centreville, *Commons*, Sep. 1878 (ANS). (ALL). Maryland: cecil: Fairhill, *Benner 5321* (ANS). garrett: Grantsville, *Stone*, Aug. 1911 (ANS). montgomery: Great Falls, *Holm*, Sep. 1915 (G). District of Columbia: Washington, *Mohr*, Sep. 1882 (US). Virginia:

FAIRFAX: Great Falls, *Wismer 432* (Duke, UP). JAMES CITY: Williamsburg, *Grimes 4580* (M). PAGE: Luray to Stony Man, *Tidestrom 6709* (US). WEST VIRGINIA: BARBOUR: Tygart Jct., *Moore 2584* (G). MONROE: Sweet Springs, *Steele 245* (G, NB, US). NORTH CAROLINA: HAYWOOD: Waynesville, *Biltmore herb. 627a* (G, NB, US). ROCKINGHAM: Spray, *de Chalmot* (US). ALABAMA: CHOCTAW: Cocoa, *Schuchert*, Oct. 1896 (NB). JEFFERSON: Birmingham, *Schuchert*, Oct. 1896 (M, US). ST. CLAIR: Ashville, *Mohr*, Sep. 1899 (US). TALLADEGA: Talladega Creek, *Mohr*, Sep. 1892 (US). (ALL). LOUISIANA: In the ANS collection is a *nearly smooth* specimen perhaps from this state: it is marked "*Tainturier*" (perhaps an error). KENTUCKY: BELL: Cumberland River, *Kearney 462* (M, NB). HARRISON: Lair (Donovan) Pike, *Singer 458* (CCD). NELSON: Chaplin, *Pennell 13670* (ANS). TENNESSEE: CHEATHAM: Craggie Hope, *Svenson 314* (G). COCKE: Lemon's Gap, *Kearney 807* (M, NB, US). SHELBY: Memphis, *Fendler*, Sep. 1853 (G). The last is smaller and smoother than usual, and was identified by Asa Gray as var. *ludoviciana*, but is closer to the typical form. OHIO: HAMILTON: Cincinnati, *Stephenson*, Oct. 1930 (R, UGa). LICKING: Granville, *Jones 1352* (R). OTTAWA: Bay Point, *Eames and MacDaniels 273* (UP). INDIANA: BLACKFORD: Mollie, *Deam 334* (US). DAVIESS: Washington, *Deam 53259* (CCD). ST. JOSEPH: South Bend, *Deam 55578* (CCD). ILLINOIS: COOK: nr. Chicago, *Greenman 3599* (G). PULASKI: Mounds, *Palmer 16564* (ANS). STARK: Wady Petra, *Chase 178* (ANS). VERMILION: Catlin, *Lansing 3501* (G, US, W). MICHIGAN: BAY: Kawkawlin, *Dreisbach 5476* (ANS, UP). DELTA: Escanaba, *Henry 206* (UP). WASHTENAW: Ann Arbor, *Sudworth 267* (US). WISCONSIN: GRANT: Kieler, *Fassett 12525* (W). IRON: Saxon, *Bobb 613* (W). LINCOLN: Merrill, *Cheney 2842* (W). POLK: St. Croix Falls, *Fassett 8195* (W). MINNESOTA: ANOKA: Ham Lake, *Oosting 2987* (approaching the var.) (Duke). GOODHUE: Zumbrota, *Ballard*, Aug. 1892 (NB, US, W). HOUSTON: Jefferson, *Lyon 310* (M). WABASHA: Kellogg, *Fassett 3319* (W). WINONA: moist meadows, *Holzinger*, Sep. 1886 (M). (ALL). IOWA: BENTON: Vinton, *Davis* (W). DECATUR: *Anderson*, Sep. 1904 (R). JOHNSON: Iowa City, *Somes 3597* (US). POWESHIEK: Grinnell, *Jones*, ann. 187– (R). (ALL). MISSOURI: JACKSON: moist ground, *Bush 334* (G, M, NB, US). MARION: Hannibal, *Davis 1220* (G, NB). RALLS: nr. Oakwood, *Davis*, Sep. 1916 (M). ST. LOUIS: "Endroits humides," *Riehl 315* (NB). STODDARD: Dexter, *Bush 6927* (NB, US). STONE: Galena, *Palmer 4614* (R). (ALL). *South Dakota:* MINNEHAHA: Sioux Falls, *Thornber*, Aug. 1892 (G); this plant has smooth leaves, but otherwise resembles closely the eastern form. (ALL).

West of the Mississippi River this species runs into a variety, passing as var. *ludoviciana* A.DC., distinguished as follows:

Var. LUDOVICIANA A. DeCandolle, Prodr. Syst. Veg. VII: 377. 1839. TYPE LOCALITY: "in Louisiana (Tainturier)." TYPE SPECIMEN:

authentic material not seen. DeCandolle's description is as follows: "caule glabro, foliis lanceolatis subintegris glabris, calyce glabriusculo." The plant now passing as var. *ludoviciana* A.DC. is a western one of prairie and mountain regions, perfectly distinct, and fitting DeCandolle's description. However, Tainturier is known to have collected largely on the Coastal Plain of Louisiana (acc. to Pennell), and there is a specimen of *Lobelia siphilitica* in the Academy of Natural Sciences of Philadelphia, marked "Louisiana, Tainturier," which resembles rather material from central Alabama than that from the Northwest. Furthermore, Louisiana a century ago was a much more extensive territory than today. Any positive settlement of the identity of this variety must await examination of authentic material. —*L. Bollii* Wimmer, Fedde Rep. Spec. Nov. XXVI: 3. 1929.—Stem often shorter than in the typical form, 30–60 cm. high (rarely 90 cm. or more), smooth (rarely short-hirsute). Leaves smooth, sub-entire or shallowly toothed, usually oblong-lanceolate, acute at both ends, averaging about 1.5–2.0 × 6.0 cm. Inflorescence often fewer-flowered than in the typical form. Flower-measurements about as in the typical form.

Differs mainly by the shorter average size, smooth leaves and stem, smaller and definitely narrow leaves, smoothish calyx, and the narrower, acute, and often connate auricles. Many intermediate plants appear in the Mississippi Valley.

Low places in prairies, sandy or gravelly margins of ponds and streams, wet meadows, sometimes on limestone cliffs; Wisconsin and Minnesota to Manitoba, south and west to Colorado, Oklahoma and Texas; prairies and mountains. Flowering period about as in the typical form. Representative material seen: (The citations marked with an (*) are those of plants somewhat intermediate between the variety and the type). Illinois: cook: Des Plaines, *Strahler*, Sep. 1908 (part) (W*). (ALL). Wisconsin: burnett: Hertel, Austin L., *Fassett 8181* (W). dane: Madison, *Sumner*, Aug. 1895 (W). polk: Star Prairie, *McLaughlin 1210* (W). st. croix: Hudson, *McLaughlin 1211* (W). washburn: Spooner, *McLaughlin 1207* (W*). (ALL). Minnesota: becker: DeSoto Lake, *Grant 3069* (ANS, G, M, US). goodhue: wet meadows, *Sandberg*, Jy. 1886 (M*). hennepin: Minneapolis, *Sheldon 1662* (M). Fort Snelling, *Mearns*, Aug. 1888 (NB*, US*). lincoln: Lake Benton, *Sheldon 1322* (M). ramsey: Snail Lake, *Jackson*, Sep. 1926 (UP*). st. louis: Tower, *Lugger*, Jy. 1891 (M*). winona: Winona, *Holzinger*, Aug. 1888 (R*). Iowa: emmet: Armstrong, *Cratty*, Aug. 1900 (US*). fayette: Fayette, *Fink*, Jy. 1894 (M*) johnson: *Somes A3017* (US*). plymouth: Akron, *Bredall*, Sep. 1909 (US*). (ALL). Missouri: greene: Springfield, *Standley 8464* (US). (ALL). Arkansas: baxter: Baxter, *Palmer 4741* (R). benton: *Plank*, ann. 1899 (CM*, NB*). garland: "close to the Hot Springs, Ark.", *Engelmann*, Sep. 1835 (G). (ALL). Oklahoma: ottawa: Ottawa, *Stevens 2416* (G). (ALL).

TEXAS: DALLAS: Dallas, *Reverchon*, Sep. 1875 (G). (ALL). NORTH DAKOTA: RANSOM: Lisbon, *Fieldstad*, Aug. 1898 (R). (ALL). SOUTH DAKOTA: Cascade Falls, limestone cliffs, *McIntosh 814* (R). CUSTER: Woodplain Battle Creek, *Over 13746* (R). PENNINGTON: Rapid City, *Williams*, Aug. 1892 (US*). ROBERTS: Big Stone Lake, *Over 14298* (US). NEBRASKA: HOLT: Beaver Creek, *Clements 2857* (Del, G, M,

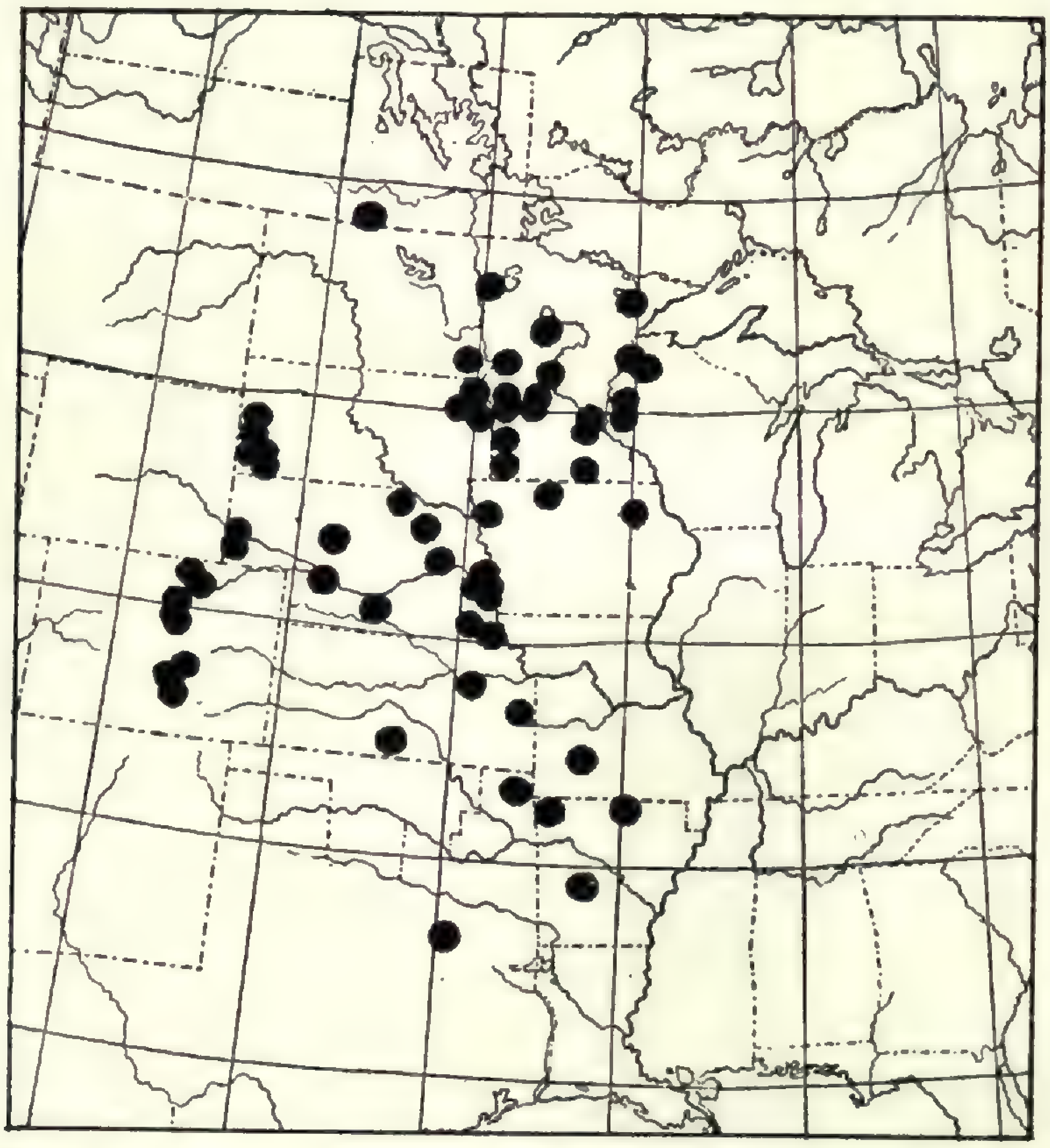

FIG. 6. Range of LOBELIA SIPHILITICA, var. LUDOVICIANA.

NB, US). LINCOLN: North Platte, *Shear 4740* (US). SCOTTS BLUFF: Scotts Bluff, *Hildreth 520* (R). KANSAS: DOUGLAS: Lawrence, *Stevens* (US*). KINGMAN: Calista, *Carleton 550* (US). RILEY: wet places, *Norton 317* (G, NB, R, US). (ALL). COLORADO: CUSTER: Wet Mts., *Brandegee 813* (ANS, NB). WELD: New Windsor, *Osterhout*, Aug. 22, 1902 (ANS, G, R, W). MANITOBA: SOURIS: "Turtle Mt., N.W.T.", *T.J.W.B. 139*, Jy. 26, 1874 (Toronto). (ALL).

3. L. AMOENA Michaux, Fl. Bor. Am. II: 153. 1803. TYPE LOCALITY: presumably in Carolina. There is no material of this species in the Michaux herbarium in Paris; the original description, which is given wholly without additional data as to locality or habitat, may apply to the species here included under the name; it applies equally well to *L. elongata* Small. The description follows: "L. majuscula, erecta, glaberrima; foliis lato-lanceolatis, serratis: spica multiflora,

secunda: calycis laciniis integerrimis: corollae coerulae laciniis inferioribus ovalibus, acutis."—*L. siphilitica* ?, Walter, Fl. Car. 218. 1788, referred by Gray to this species, was probably *L. elongata* Small, as was the *L. puberula* var. *glabella*, Elliott, Sk. Bot. S. C. & Ga. I: 267. 1821. Not *L. amaena* A. DeCandolle, Prodr. Syst. Veg. VII: 377, which is a form of *L. puberula* Mx. *L. glandulosa* var. *glabra* A. DeCandolle, l. c. 378 (acc. to Gray).—Stem upright, unbranched, rather coarse, 30–120 cm. high, light green (sometimes reddish at base), smooth or somewhat hirsute-pubescent below. Leaves cauline, rather widely spaced, 6–15, very thin in texture, acute at the base; the lower sub-petiolate; smooth, or pubescent mostly on the veins beneath, and strigose above. Lower leaves sub-entire or somewhat serrate, oblong or ovate, usually obtuse, from 1.5 × 4 to 4.5 × 12–18 cm. Upper leaves narrower, sometimes lanceolate, often prominently denticulate. Bracts (sometimes with the exception of the lowest) not leafy, giving the inflorescence a naked appearance. Inflorescence a terminal raceme, 10–40 cm. long, usually strongly secund, rather loosely few–40 flowered. Pedicels rather slender, curved, 3–5 mm. long in fruit, short prickly-ciliate or smoothish, each with a pair of rather prominent bracteoles (sometimes 1 mm. long) near the base. Flower-bracts smooth, callose-denticulate, linear, 1–2 cm. long; the lowest often leafy, lanceolate or broader, 2–4 cm. long; sometimes all bracts leafy. Calyx in anthesis hemispheric, smooth or with a few hairs, becoming globose or somewhat flattened in fruit, widest about the middle or below, 5–8 mm. across by 4–7 mm. high. Capsule mostly inferior. Calyx-lobes smooth, entire, 5–12 mm. long (ave. 6–8 mm.), flat, linear, less than 1 mm. wide, or the base broad, short-deltoid, the upper portion linear. Auricles none or very small. Flower 18–24 mm. long, including calyx (ave. 20–22 mm.). Corolla bright blue, with a light eye, smooth. Corolla-tube fenestrate; lobes of the lower lip broad-ovate, obtuse, sometimes even spatulate, often apiculate, sometimes as long as the tube; upper lobes lanceolate. Filament-tube 5–7 mm. long, pubescent below, connate only about a third of its length above. Anther-tube 2.5–3.5 mm. long, light bluish-gray, the two smaller anthers tufted, the three larger smooth or pubescent on the backs.

This species is readily distinguished from *L. puberula* and its forms by the general smoothness, the round calyx, narrow calyx-lobes, broad entire leaves, and the somewhat larger corolla, which seems even larger in proportion because of the small calyx-lobes and bracts. However, it is very possible that hybridization occurs where the two grow together; plants are found with intermediate leaf-characters, calyx-characters, and pubescence.—Swamps, moist rich woods or wet rocks, western North Carolina and eastern Tennessee south to northern Georgia and Alabama. Mountains and Piedmont. Flower August–October. Representative Material seen: Tennessee: knox: Knoxville, *Ruth*, Sep. 1895 (Mo); this plant is on a sheet with two

other species, indicating a possibility of confusion. ALABAMA: CLAY: *Troyer*, ann. 1908 (G). LEE: Auburn, *Earle and Baker*, Oct. 1897 (M, NB). GEORGIA: CLARKE: Oconee Heights, *Reade*, Oct. 1928 (UGa). COBB: Marietta, *Hamlin*, Sep. 1928 (UGa). DEKALB: Stone Mountain, *Small*, Sep. 1894 (ANS, NB). FANNIN: Blue Ridge Mts., *H. H. Smith 2628* (W). HABERSHAM: Toccoa Falls, *Small*, ann. 1894 (NB). RABUN: Tallulah Falls, *Small*, Sep. 1894 (Mo, NB); RICHMOND: Augusta, *Cuthbert*, Sep. 1899 (NB). UNION: Youngcane, *Pennell 14053* (ANS). SOUTH CAROLINA: GREENVILLE: Saluda Falls, *J. D. Smith*, Aug. 1881 (ANS, G, NYS). LEXINGTON: Batesburg, *McGregor 227* (US). NORTH CAROLINA: BUNCOMBE: Biltmore, *Biltmore herb. 622b* (ANS, G, M, Mo, NB, W). HENDERSON: Muddy Creek, *J. D. Smith*, Aug. 1881 (G). MACON: Highlands, *Biltmore herb. 622c* (ANS, G, Mo, NB, UP). POLK: Tryon, *Wherry*, Sep. 1934 (UP). TRANSYLVANIA: Pink Beds, *Biltmore herb. 622a* (G, NB).

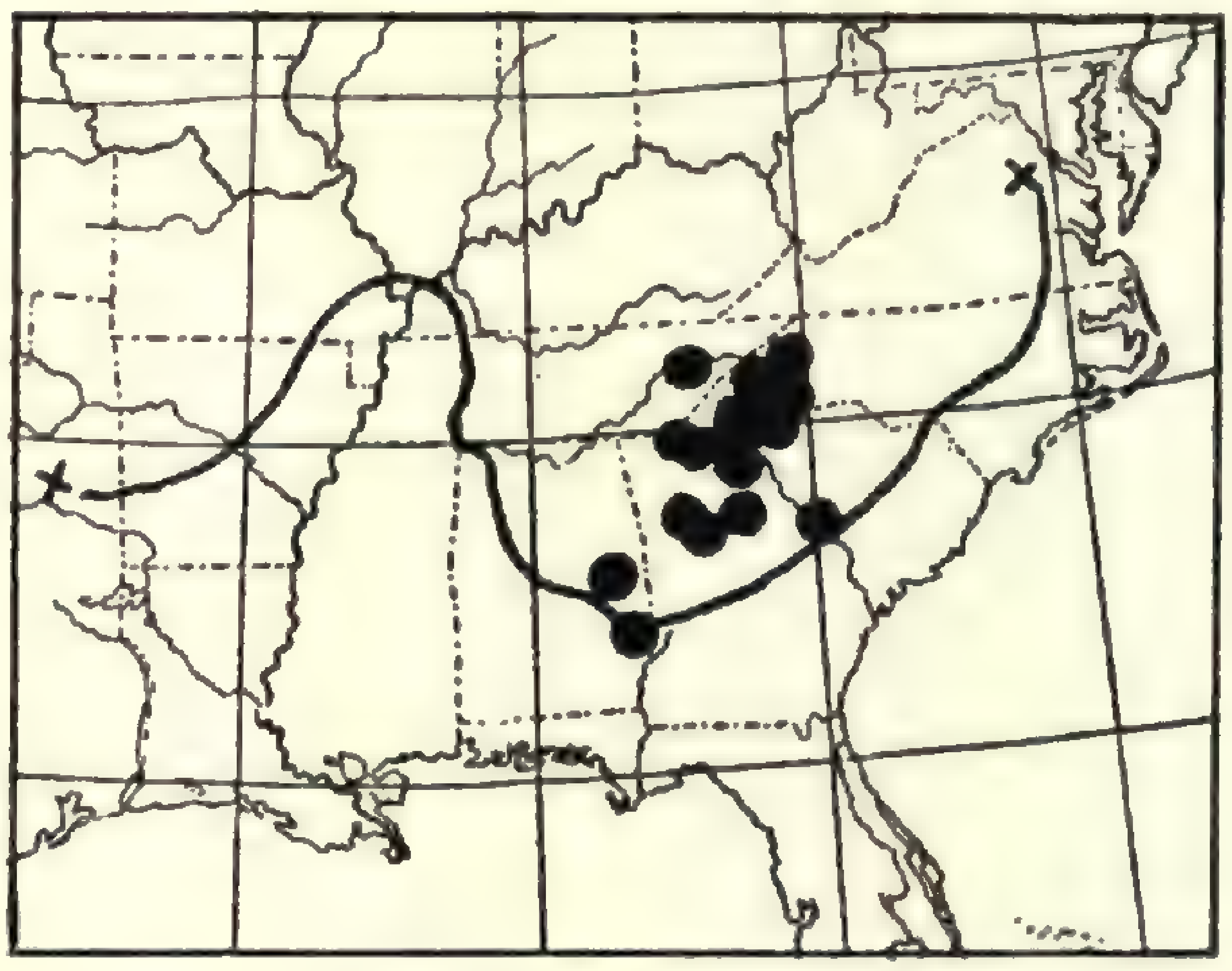

FIG. 7. Range of LOBELIA AMOENA.

4. L. ELONGATA Small, Fl. S.E.U.S. 1144. 1903. TYPE LOCALITY: Northwest, Norfolk Co., Va. TYPE SPECIMEN: *Heller 1246*, in the herbarium of the New York Botanical Garden. Stem upright, unbranched, slender or rather heavy at the base, 30–150 cm. high (120 cm. according to Small), green or with a purplish tinge, darker near the base; smooth. Leaves cauline, few–20, more or less upright-appressed, narrowly lanceolate, sharply dentate or sub-entire, long-acute at both ends, with prominent veins, smooth or strigose; sometimes papillose beneath; average size about 1.3 × 8.5 cm. (0.5–2.5 × 5–12 cm.). Upper leaves gradually smaller, but definitely larger than the bracts of the inflorescence. Inflorescence a terminal raceme 10–30 cm. long (ave. 15–20 cm.), strongly secund, rather densely few–50 (ave. about 20) -flowered. Pedicels rough, 4–7 mm. long in fruit, each with a pair of bracteoles near the base. Flower-bracts smooth, dentate, lanceolate or linear, 1–2 cm. long, inconspicuous or the lowest leafy. Calyx in anthesis short-hemispheric, smooth or with a few hairs, becoming sub-globose in fruit, 6–8 mm. across, broadest at the middle. Capsule mostly inferior. Calyx-lobes smooth, linear-subulate or with a short-deltoid base, 6–13 mm. long (ave. about 9 mm.). Auricles none or very small. Flower 20–25 mm. long, including calyx (ave. 22.5 mm.). Corolla deep blue (acc. to Small), smooth. Corolla-tube fenestrate; lobes of the lower lip broad-ovate or

oblong, shorter than the tube; two upper lobes lance-linear. Filament-tube 8–11.5 mm. long (ave. 9 mm.), pubescent below, connate about half its length above. Anther-tube 4 mm. long, bluish-gray, the two smaller anthers tufted, the three larger pubescent on the backs or nearly smooth.—Swamps, low grounds, tidal marshes; near the coast, Georgia to southern Delaware (south to Florida and west to Louisiana, according to Small). Flower August–October. Representative Material seen: Georgia: liberty: nr. Sunbury, *L. LeConte* (NB). South Carolina: berkeley: Santee Canal, *Ravenel* (G). dorchester: Summerville, *Brownfield,* Oct. 1892 (Mo). North Carolina: columbus: Whiteville, *Schallert 1647* (Duke). new hanover: Wilmington, *Williamson,* ann. 1900 (ANS, NB). Virginia: norfolk: Northwest, *Heller 1246* (ANS, G, M, Mo, NB, UP). Maryland: somerset: Princess Anne, *Canby* (ANS, Del, G, Mo, NB, O, UP). Delaware: sussex: Millsboro, *Commons,* Sep. 1877 (ANS, NB).

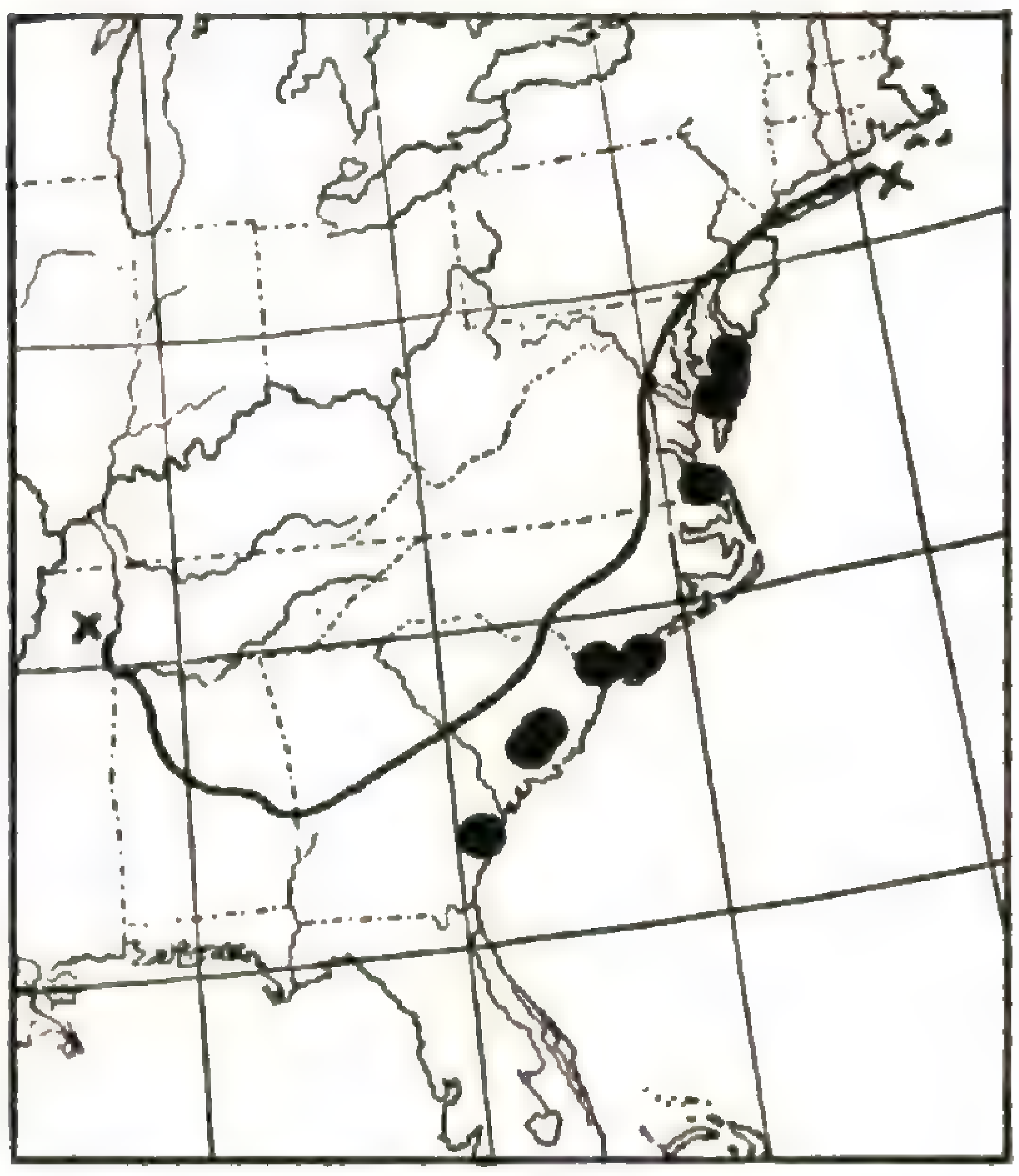

Fig. 8. Range of Lobelia elongata.

5. L. glandulifera (Gray) Small, Fl. S.E.U.S. 1144. 1903. Type Locality: "S. Virginia to Florida and Alabama." Type Specimen: Small gives as a synonym *L. amoena* var. *glandulifera* Gray (Syn. Fl. 4. 1878). Material identified by Gray as this variety, now at the Gray Herbarium and at New York Botanical Garden, is a mixture of two things; the first is the plant called *L. glandulifera* by Small and later authors, and the second seems to be a hybrid of *L. brevifolia* Nutt. The original description of var. *glandulifera* Gray is so worded that it fits either the former, which is smooth and lacks auricles of the calyx-lobes, or the latter, which is hirsute-pubescent and has the calyx decidedly auriculate. In view of this confusion, I am typifying *L. glandulifera* by the element of Gray's material which Small and later authors have treated as a species.—*L. amoena* var. *obtusata* Gray, Syn. Fl. 4. 1878.—Stem upright, slender, rather weak, unbranched, 30–125 cm. high, green or dark purplish-red near the base, smooth or rarely short-hirsute. Leaves cauline, widely spaced, 6–20, spreading, smooth (rarely with a few hairs beneath), thick, with a parchment-like texture and a characteristic bluish-green or gray-green sheen in dried material. Leaves short-ovate or elliptic, broadest at or below the middle, mostly short-acute at both ends, with small sharp regular

teeth or sub-entire, mostly sub-petiolate, averaging about 2 × 5.5 cm. (sometimes 2–3 × 7–12 cm.). Upper leaves distinctly larger than the small flower-bracts, giving the inflorescence a naked appearance. Inflorescence a loose terminal raceme, bearing 1–20 (30) rather widely separated flowers upon stout erect smooth pedicels (2.5–4 mm. long in fruit), each with a pair of bracteoles near the base. Flower-bracts smooth, narrow, 1–2 cm. long, inconspicuous, prominently glandular-toothed or lobed. Calyx in anthesis conic or short-hemispheric, smooth or rarely with a few hairs, becoming hemispheric or sub-globose in fruit, strongly ribbed; mature fruit seen only a few times: somewhat flattened, 4.5–6.5 mm. across by 4.5–6.0 mm. high, usually broadest at the top. Capsule half inferior or more. Calyx-lobes smooth, narrow, nearly linear or with a broad base, 5–8 mm. long, acuminate, with 0–6 prominent glandular teeth. Auricles none or very small. Flower 20–26 mm. long, including calyx, averaging about 22.5 mm. Corolla blue, smooth. Corolla-tube fenestrate; lobes of the lower lip ovate or oblong, broadly obtuse or short acute, often as long as the tube or longer; two upper lobes oblong. Filament-tube 6.5–8.5 mm. long (ave. about 7.5 mm.), pubescent below, connate less than half its length above. Anther-tube 3.0–3.5 mm. long, light bluish-gray, the two smaller anthers tufted, the three larger merely pubescent on the backs.

The following field-notes by A. H. Curtiss (accompanying 6938 in Gray herb.) may be of value:

"A handsome sp., with azure fls. and very thick leaves, growing in low and rich but not wet land. Stem 1–4 ft. long, the lower ¼ bare, the longer ones sprawling about, with only the upper portion erect. Leaves dark green above, whitened beneath, some lower ones with petioles fully 1 in. long. Margins of leaves wavy denticulate—teeth elevated, sinuses depressed. Calyx-teeth with 6–8 curved, subulate teeth."

Low grounds, meadows, swamps, and moist woods, eastern Tennessee and western North Carolina to northern Florida, north to southern Virginia. Mountains, Piedmont, and Coastal Plain. Flower July–November. Representative material seen: TENNESSEE: KNOX: Knoxville, *Ruth*, Sep. 1895 (Mo), possibly an error. FLORIDA: GADSDEN: Quincy, *Chapman* (ANS). HOLMES: Ponce de Leon, *Curtiss 6938* (Del, G, M, Mo, NB). JACKSON: Marianna, *Curtiss 1639* (G, M), as *L. amoena*. LIBERTY: Aspalaga, *Chapman*, Biltmore herb. 6168 (G, M, Mo, NB). GEORGIA: BIBB: Macon, *G. N. Green ?* (ANS). RANDOLPH: Cuthbert, *Harper 1758* (G, Mo, NB). NORTH CAROLINA: BUNCOMBE: Biltmore, *Ashe*, Biltmore herb. 622b (Mo). CATAWBA: Hickory, *Wherry*, Sep. 1934 (UP). DURHAM: Durham, *Martin*, Oct. 1916 (Duke). FORSYTH: Winston-Salem, *Schallert*, Sep. 1921 (Duke, G). LINCOLN: Lincolnton, *Curtis* (Torrey herb., NB). ORANGE: Chapel Hill, *Coker*, Sep. 1909 (NC). PASQUOTANK: Elizabeth City, *Moldenke 108* (NB; a fragment only). WAKE: Raleigh, *Ashe*, Curtiss 6453 (Del, M, Mo, NB). VIRGINIA: HANOVER: Noel, *Brinton*, Oct.

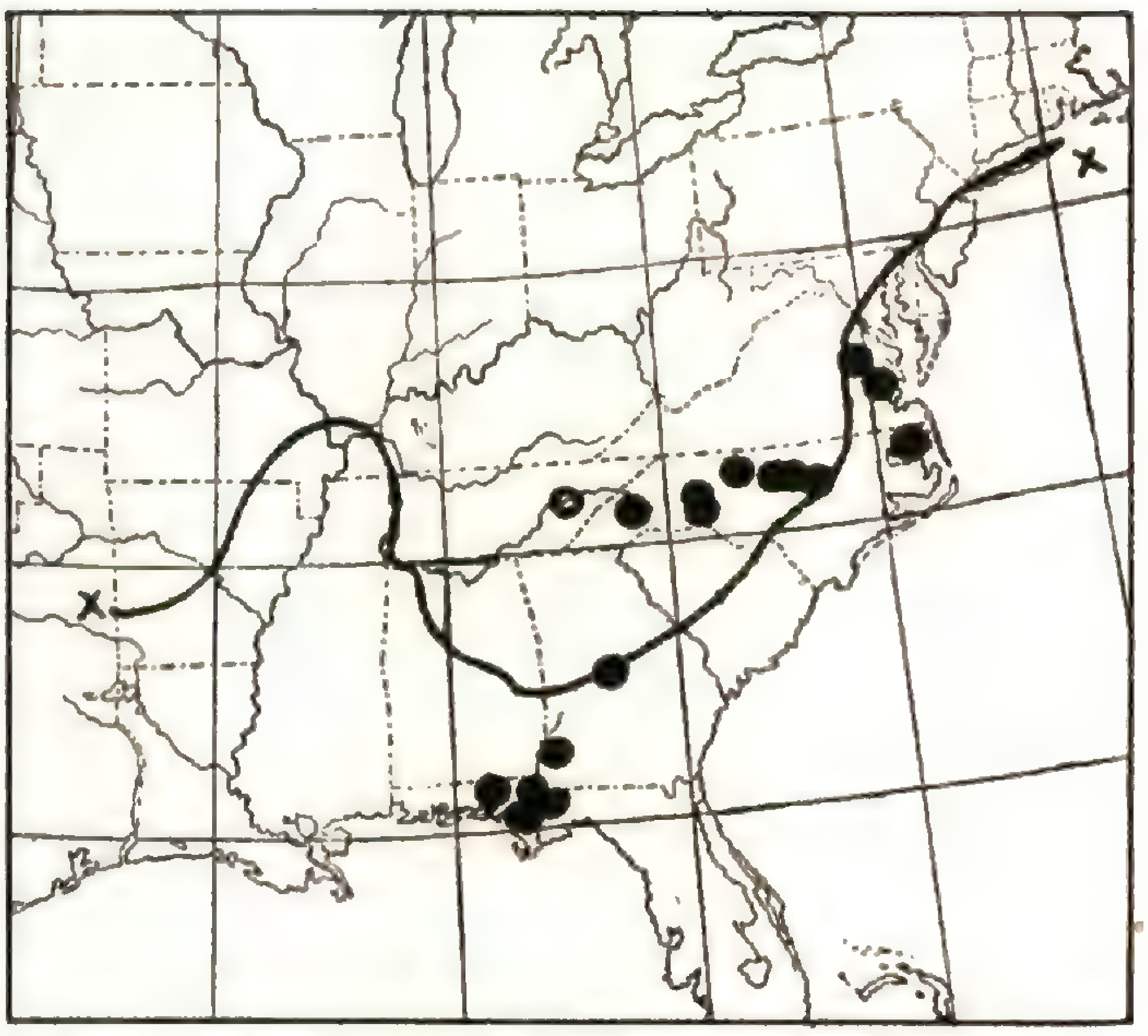

Fig. 9. Range of Lobelia glandulifera.

1890 (NB, UP). James City: Ewell, *Grimes 4472* (NB). In the Academy of Natural Sciences of Philadelphia is a specimen collected by Pursh in 1806 in Greensville or Southampton County, Va. This may be a duplicate of one in New York in the Torrey herbarium, labelled "Greenville" and "herb. Barton."

6. L. glandulosa Walter, Flora Carolin. 218. 1788. Type Locality: "Carolina Meridialis, ad Ripas Fluvii Santee." Type Specimen: There are in the Gray Herbarium a few fragments of what is now passing as *L. glandulosa*, inscribed by Asa Gray "Herb. Walter!" Gray considered this plant to be the *L. glandulosa* of Walter. The description from the "Flora Caroliniana" is given here: "caule erecto subpiloso, foliis oblongis obtuse sublanceolatis subdentatis longitudine florum, flor. axillaribus solitariis purpureis pedunculis brevibus, bracteis 2 glandula terminatis, capsulis villosis, *calycis laciniis dentatis* longis suberectis."—*L. crassiuscula* Michaux, Fl. Bor. Am. II: 152. 1803. Although there is no material of this species in the Michaux herbarium, his description leaves little doubt; he himself, however, indicates doubt that *L. glandulosa* Walt. is a synonym. *L. glandulosa* A. DeCandolle, Prodr. Syst. Nat. VII: 378. 1839 (in part). DeCandolle was confused by what seems to be hybrid material of *L. brevifolia* Nutt. (Torrey herbarium, New York Botanical Garden).—Stem slender, unbranched, weak, erect or ascending, 30–140 cm. long (often tall, 90–100 cm.), smooth, green, or darker below. Internodes sometimes zigzag. Leaves cauline, few–20, smooth, thick, narrowly linear to broad-lanceolate, 0.2–1.4 × 3–15 cm. (ave. about 0.6 × 8 cm.), on the average about 15 times as long as wide, decurrent, not much narrowed at the base except the lowest; somewhat appressed to the stem, strongly callose-denticulate or sub-entire in outline. Upper leaves merging into the floral bracts, but the larger leaves well below the inflorescence. Inflorescence a lax terminal raceme, usually strongly secund, bearing 1–20 (ave. 8–10) rather widely separated flowers upon stout, rough-puberulent or hirsute straight upright pedicels (5–13 mm. long in fruit), each with a pair of bracteoles near the base. Flower-bracts smooth, linear, rarely

much exceeding the pedicels, usually strongly callose-denticulate. Calyx in anthesis short-hemispheric or flatter; smooth, puberulent or long chaffy-hirsute, becoming hemispheric or sub-globose in fruit, 6–8 mm. in diameter. Capsule more than ¾ inferior. Calyx-lobes narrow, almost linear, or broader (long-lanceolate or wedge-shaped), smooth, acute, 3–15 mm. long, usually strongly callose-denticulate; sometimes entire. Auricles none, or small and triangular. Flower 20–33 mm. long, including calyx (ave. 24–25 mm.). Corolla blue with a white eye, smooth except for the pubescent or strongly hirsute base of the lower lip, or pubescent outside also. Corolla-tube fenestrate; lobes of the lower lip oblong or ovate, sometimes acute, about the length of the tube; sometimes reaching a size of 8 × 16 mm.; two upper lobes narrow-ovate, curved upward. Filament-tube 7.5–10 mm. long (usually 8.5–9 mm.), pubescent below, connate above often more than half its length. Anther-tube 3.5–4 mm. long, light bluish-gray, all five anthers tufted, or the three larger merely pubescent on the backs.

This species is very variable in the amount of pubescence of the pedicel and calyx, and in the number of the callose-glandular teeth on the leaves and calyx-lobes. Some individuals are seen with nearly or wholly entire leaves and lobes of the calyx. However, the large flowers and the hirsute lower lip, together with the (usually) linear leaves and stiffly upright pedicels, as well as the long filaments, will usually serve to characterize the plant, even if the glandular teeth are lacking.

Swamps and wet land, often in pineland, Florida to southern Virginia; reported from Mississippi, according to Small. There is in the Academy of Natural Sciences of Philadelphia a somewhat doubtful example of this species, collected by Lindheimer in Texas in 1843. Coastal Plain. Flower Summer and Fall; in Florida more or less throughout the year. Representative material seen: FLORIDA: ALACHUA: Gainesville, *Fawcett*, Nov. 1911 (UP). BREVARD: "Indian River region," *Fredholm 5662* (G). COLUMBIA: Lake City, *Mohr*, Oct. 1895 (Del). DADE: Miami, *Small and Carter 538* (ANS, NB). DUVAL: Jacksonville, *Curtiss 5325* (ANS, Del, M, NB, NYS). FRANKLIN: Apalachicola, *Chapman* (Biltmore herb. 2678b) (G, Mo, NB). GADSDEN: Quincy, *Chapman* (ANS). HAMILTON: White Springs, *Huger*, Dec. 1898 (NB). LEE: Ft. Myers, *Miss Standley 60* (CM, G, Mo, NB). LEON: nr. Tallahassee, *Berg*, (NB). LEVY: *Garber*, Oct. 1877 (ANS, G, Mo, UP). MANATEE: Bradentown, *Tracy*, Oct. 1900 (CM, G, M, Mo, NB, UP). MONROE: Pine Crest, *Moldenke 357* (Duke, Mo, NB, UP). ORANGE: Bithlo, *Moldenke 207* (Duke, Mo, NB, UP). OSCEOLA: Kissimmee, *Mearns 34* (US). PASCO: St. Leo, *O'Neill* (Mo). PINELLAS: St. Petersburg, *Mrs. Deam 2911* (M). POLK: Ft. Meade, *Jennings*, Dec. 1919 (CM). ST. JOHNS: St. Augustine, *Reynolds*, ann. 1877 (NB). SEMINOLE: Sanford, *Moldenke 5348* (NB). VOLUSIA: Deland, *LaForce*, Nov. 1920 (NYS). GEORGIA: BALDWIN:

Milledgeville, *Boykin* (ANS, NB). COLQUITT: Moultrie, *Harper 1663* (G, Mo, NB). GLYNN: Brunswick, *Pennell 4822* (NB, UP). LIBERTY: nr. Sunbury, *L. LeConte* (Torrey herb., NB). PIKE: Zebulon, *Harper 2242* (G, Mo, NB). RICHMOND: Augusta, *J. D. Smith*, Sep. 1883 (G). TATNALL: Reidsville, *Leeds*, Oct. 1933 (ANS). WARE: Manor, *Mrs. Lovett*, Oct. 1933 (Duke). SOUTH CAROLINA: AIKEN: Graniteville, *Eggert*, Aug. 1898 (Mo). BEAUFORT: Hardeeville, *Leeds*, Oct. 1933 (ANS). BERKELEY: Santee Canal, *Ravenel*, Sep. (G). CHARLESTON: Charleston, *Moldenke 143a* (NB). COLLETON: Walterboro, *Leeds*, Oct. 1933 (ANS). DARLINGTON: Hartsville, *Norton*, Nov. 1921 (NC). DORCHESTER: Summerville, *Brownfield*, Oct. 1892 (M, NYS). JASPER: Ridgeland, *Mohr*, Nov. 1895 (Mo). RICHLAND: Columbia, *J. D. Smith*, Sep. 1883 (Mo). NORTH CAROLINA: BRUNSWICK: Wilmington, west of river, *Bartram*, Oct. 1908 (ANS). COLUMBUS: *Schallert*, Nov. 1926 (Duke). JOHNSTON: State Forest Nursery, *Blomquist 6716* (Duke). NEW HANOVER: Wilmington, *McCarthy*, Sep. 1888 (NC). PENDER: *Holmes*, Sep. 1884 (NC). VIRGINIA: *Mr. Bailey*, ann. 1841 (NB); Gray cites the species from "s. Virginia" in his Synoptical Flora, on Bailey's authority. Kearney (*33*) (1901) cites his own 2378, collected "in open fresh-water marshes of the Northwest River" (Norfolk Co., Va.).

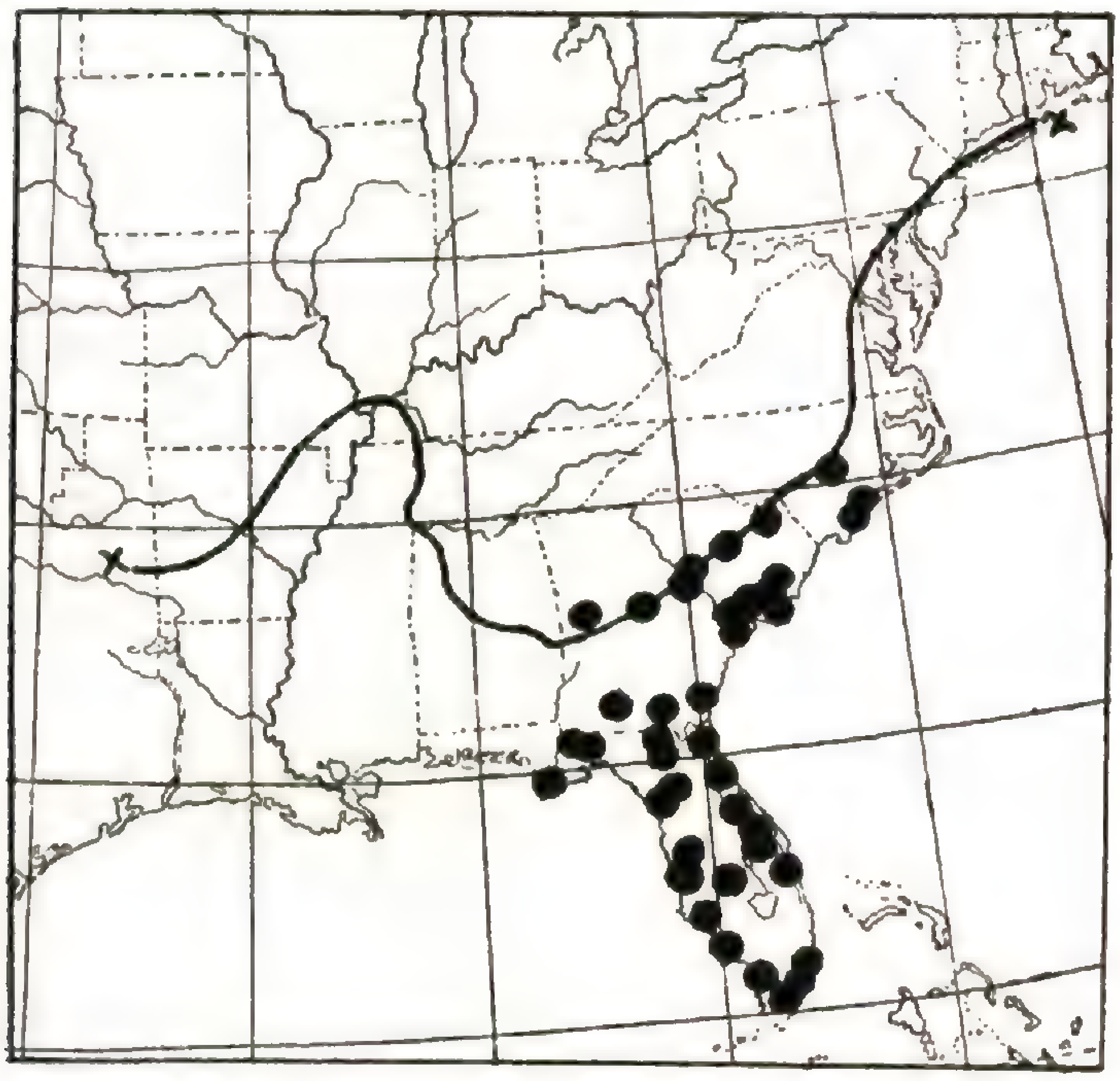

FIG. 10. Range of LOBELIA GLANDULOSA.

7. L. BREVIFOLIA Nuttall, A.DC. Prodr. Syst. Veg. VII: 377. 1839. TYPE LOCALITY: "in Alabama Americae bor.". TYPE SPECIMEN: material from Nuttall's herbarium is in the Academy of Natural Sciences of Philadelphia.—*L. Ludoviciana* Wood, Class Book 476. 1861.—Stem slender, unbranched, rather weak, 30–90 cm. high, smooth or nearly so, green or tinged with purplish-red near the base. Cauline leaves 20–100 (in cases of fasciation 200), close together; linear, oblong, or the lower oblanceolate, short-acute or obtuse, 0.2–0.8 × 0.7–3.0 cm. (ave. 0.5 × 1.5 cm.), strongly pectinately toothed, the teeth callose-tipped. Leaves smooth or somewhat

strigose, decurrent, not much narrowed at the base, except the lowest; the upper more distant and merging gradually into the bracts of the inflorescence. Inflorescence a loose terminal raceme, strongly secund, bearing few–30 (ave. about 15) flowers upon stout, upright, rough or hirsute pedicels (5–10 mm. long in fruit), each with a pair of bracteoles near the base. Flowers often standing stiffly at right-angles to the stem. Flower-bracts smooth or somewhat ciliate beneath, 0.5–1.5 cm. long, inconspicuous, strongly toothed. Calyx in anthesis short-hemispheric, smoothish or densely long-hirsute, becoming sub-globose or hemispheric in fruit. Calyx-lobes broad at the base, 4.5–8.0 mm. long (ave. about 6.0 mm.), long-acute, strongly pectinately toothed, sometimes fimbriate; auricles at the base of each lobe broad, round, foliose, usually as long as the calyx-tube and covering it; sometimes toothed. Flower 15–24 mm. long, including calyx (ave. 18–20 mm.). Corolla pale blue (acc. to Chapman, 1897); azure, acc. to Mohr, 1901; (*9*, *45*); pubescent outside, the lower lip smooth or puberulent inside. Corolla-tube fenestrate or sometimes entire except for the dorsal fissure; lobes of the lower lip narrow-ovate, short-acute, shorter than the tube; two upper lobes lanceolate. Filament-tube (5) 6.5–7.0 (8.0) mm. long, pubescent, connate above. Anther-tube 3.5–4.0 mm. long, bluish-gray, all the anthers white-tufted at the tip, or the three larger merely pubescent on the backs.—Damp pinelands, usually in sandy soil, western Florida to eastern Louisiana. Coastal Plain. Flower late Summer and Fall. Representative Material seen: FLORIDA: FRANKLIN: Apalachicola, *Saurman*, ann. 1867 (ANS); *Chapman*, Biltmore herb. 4166a (NB). HOLMES: Westville, *Curtiss 6906* (Del, M, NB). LIBERTY: Aspalaga, *Chapman*, Biltmore herb. 4166b (NB). ALABAMA: LEE: Auburn, *Earle*, Oct. 1896 (CM). MOBILE: Mobile, *Mohr* (ANS). MISSISSIPPI: HARRISON: Pass Christian, *Langlois*, Oct. 1882 (CM, NYS, UP). LOUISIANA: ORLEANS: New Orleans, *Ingalls* (Torrey herb., NB). In the Schweinitz herbarium at the Academy of Natural Sciences of Philadelphia is a specimen marked "Louisiana, Tainturier."

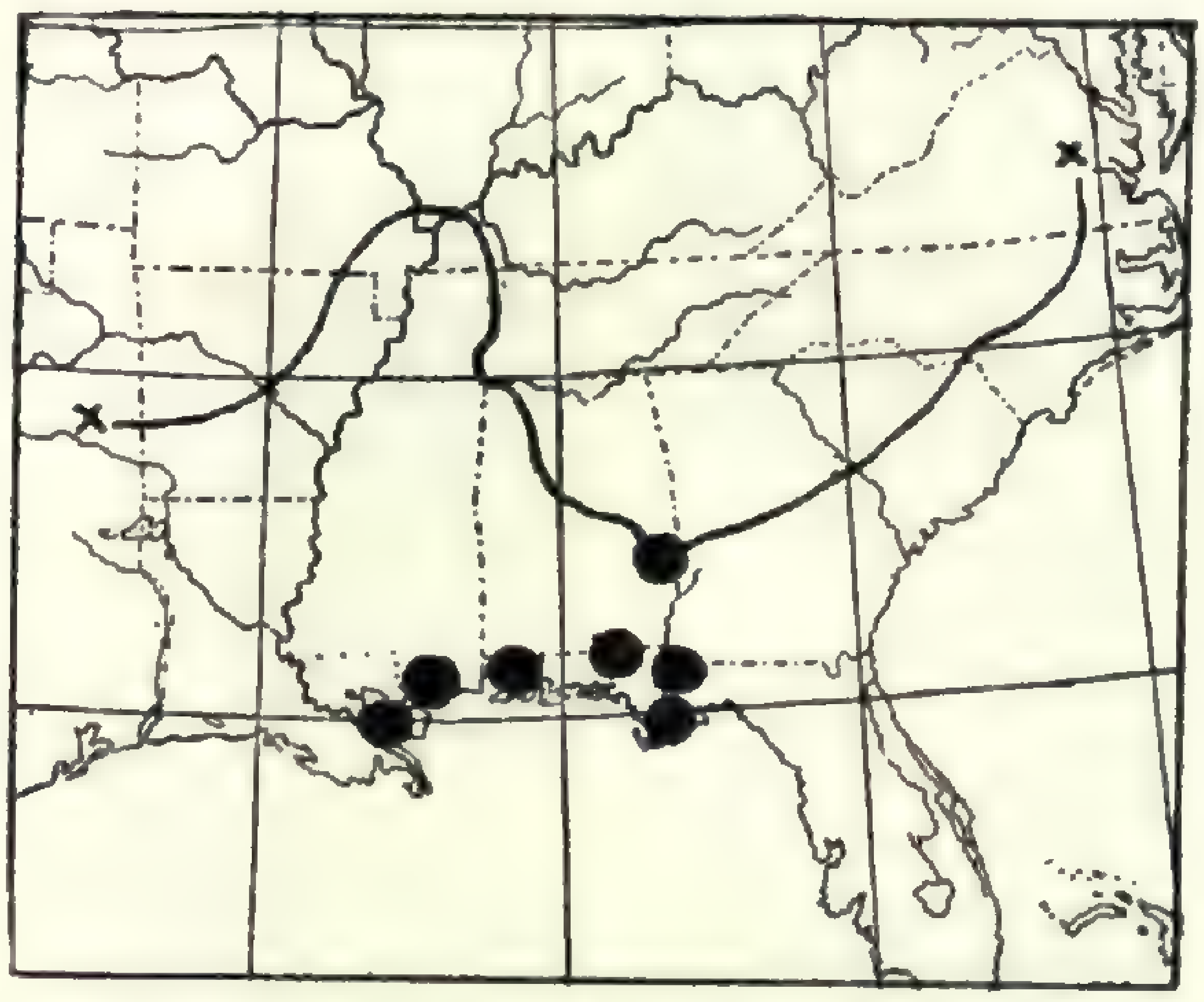

FIG. 11. Range of LOBELIA BREVIFOLIA.

Occasionally, plants are met with that show resemblances to the above species, and may be of hybrid origin; possible parents are *L. brevifolia* and *L. puberula:*

L. BREVIFOLIA × L. PUBERULA.—*L. glandulosa* A. DeCandolle,

Prodr. Syst. Veg. VII: 378. 1839 (in part). *L. amoena* var. *glandulifera* Gray, Syn. Fl. 4. 1878 (in part).—Leaves broad, more or less pubescent, inclined to be dentate. Calyx-lobes more or less strongly glandular-toothed; auricles round, rather small, but conspicuous. Calyx smooth or hirsute. Filaments sometimes reaching 9.0 mm. in length. Material seen: Florida: "west Florida," *Chapman* (NB). Alabama: *Gates* (G, NB), both identified as *L. amoena* var. *glandulifera* by Asa Gray; the one at New York named *L. glandulosa* by DeCandolle. lee: Auburn, *Earle*, Sep. 28, 1896 (CM); *Earle*, Oct. 4, 1896 (NB); *Earle*, Oct. 15, 1896 (CM, NB). mobile: *Graves 1119* (Mo). Mississippi: Kashtaw, *Tracy 4940* (NB). harrison: Biloxi, *Tracy*, Oct. 27, 1899 (NB). jackson: Ocean Springs, *Earle*, Oct. 27, 1889 (CM).

8. L. puberula Michaux, Fl. Bor. Am. II: 152. 1803. Type Locality: "Carolina." Type Specimen: There is no material of this species in the Michaux herbarium in Paris. The original description, which follows, seems to fit no other species than the one to which it is now given:

"L. erecta, simplicissima, pubescens: foliis oblongo-ovalibus, obtusis, repando-serrulatis: spica non pedunculata; floribus paucis, alternis, subsessilibus: calycibus ciliatis."

The nomenclature of this species and its forms has been in considerable confusion. DeCandolle, in the "Prodromus," seems to confuse several plants. In the absence of type material, and in view of the variability of the forms, it seems impossible at present to determine the exact identity of *L. puberula* of Michaux.

L. puberula var. *glabella* Elliott, Sk. Bot. S. C. & Ga. I: 267. 1821. is probably *L. elongata* Small.

L. puberula var. *glabella* Hooker, Bot. Mag. LXI: plate 3292. 1834. is probably the smoothish form found on the Gulf Coastal Plain.

Stem strict, usually unbranched, 30–160 cm. high, often 100 cm., green or sometimes with a purplish tinge throughout, darker below, densely short-hirsute throughout, or sometimes glabrate. Cauline leaves few–40, hairy beneath and more or less strigose above, especially near the margins; thin but fairly firm in texture; shape varying from lanceolate-acute, sub-entire in outline, with prominent callose-denticulate teeth, to broadly obovate, obtuse, with coarse irregular serrations and inconspicuous callose teeth. Upper leaves merging gradually into the bracts of the inflorescence, becoming more finely toothed above. Basal leaves none. Inflorescence a terminal unbranched raceme 4–50 cm. long (ave. 15–30 cm.), densely flowered or often somewhat interrupted; often distinctly secund, bearing few–70 flowers upon short stout puberulent or hirsute pedicels (3–5 mm. long in fruit), each with a pair of bracteoles at the base or somewhat above it. Pedicels not stiffly erect. Flower-bracts various. Calyx in anthesis flattish or short-hemispheric, more or less pubescent, or hirsute, becoming hemispheric in fruit, widest at the top, usually with

a flaring rim, prominent ribs and a rough angular appearance; 5–9 mm. across by 4–7 mm. high. Capsule about half inferior. Calyx-lobes lanceolate or broader, plainly broader near the base than near the tip, more or less straight-sided, without definite subulate tips, 5–12 mm. long, usually ciliate at least near the tip. Auricles very small and triangular, or rounded, short, formed of the rolled edges and lobes of the cordate calyx-lobes. Flower 15–24 mm. long, including calyx (ave. 18–20 mm.). Corolla blue, with a white eye, ciliate at least on the veins outside, the lip smooth. Corolla-tube fenestrate; lobes of the lower lip oblong or ovate, usually somewhat shorter than the tube, acute or obtuse; two upper lobes lanceolate, erect. Filament-tube 6–7 mm. long (rarely 9 mm.), pubescent below, connate about a third of its length above. Anther-tube 3.0–3.5 mm. long, light bluish-gray, the two smaller anthers tufted at the tip, the three larger usually pubescent on the backs.—Wet woods, low grounds, thickets, in various soils; Coastal Plain and upland provinces, Tennessee and western North Carolina north to West Virginia, southern Indiana and Illinois; northeast along the Coastal Plain from South Carolina to southern New Jersey; south to Florida, Alabama and Mississippi; west and south to Missouri, Arkansas, Oklahoma, Texas and Louisiana. Flower August 1 (rarely earlier) through the Fall.

A wide-ranging species showing several pronounced geographic forms which may or may not be worthy of varietal names; the most conspicuous are as follows:

a) A form with what may be called an Alleghanian range; rarely found on the Coastal Plain or in glaciated country; native from West Virginia south to mid-Georgia, west to Illinois and western Tennessee. In its most characteristic form it may be identified by the rather sparsely pubescent calyx-tube and lobes, small (1–1.5 cm. long) bracts, which are lanceolate or nearly linear, the narrow calyx-lobes (1.5–2.0 mm. wide by 5–12 mm. long), which are usually flat or slightly rolled on the margins to form small auricles; the leaves are often spreading rather than appressed, usually prominently callose-denticulate, even the lowest sometimes acute, tending to be three times as long as wide, or longer. This plant may be the closest, now living, to a hypothetical ancestor living in approximately the same area. Several lines of divergence from this type may be seen, leading to at least three others. Representative Material seen: VIRGINIA: BEDFORD: *Curtiss*, Sep. 1873 (Mo, NYS). WASHINGTON: Damascus, *Core 3883* (NB, WVa). WYTHE: Wytheville, *Shriver*, Sep. 1878 (ANS, G). WEST VIRGINIA: MARION: Winfield Twp., *Sharp*, Sep. 1929 (WVa). MONONGALIA: *Rumsey*, Sep. 1897 (WVa). MONROE: Peters Mt., *Steele 172* (G, Mo, NB). RITCHIE: Auburn, *Randolph 1393* (G). UPSHUR: Buckhannon, *Pollock*, Sep. 1895 (Mo). WIRT: Elizabeth, *Bartholomew 304* (WVa). NORTH CAROLINA: ASHE: *Ashe*, Aug. 1891 (NC). BUNCOMBE: Asheville, *Redfield 5635* and *5636* (Mo). BURKE: Morganton, *Moses*, ann. 1914 (NC). DURHAM: Duke Forest, *Oosting*

33326 (Duke). FORSYTH: Winston-Salem, *Schallert*, Aug. 1925 (Duke). HAYWOOD: Lake Junaluska, *Blomquist 5019* (ANS, Duke). HENDERSON: "Chimney Rock to Hendersonville," *Small and Huger*, Oct. 1901 (NB). JOHNSTON: Parkers Pond, *B. E. Smith*, Sep. 1932 (NC). ORANGE: Chapel Hill, *Coker*, Sep. 1914 (NC). PERQUIMANS: *Glasson* (Duke): PERSON: Roxboro, *Wherry*, Sep. 1934 (UP). SWAIN: Great Smoky Mts., *Beardslee and Kofoid*, ann. 1891 (G, M, Mo, NB, WVa). SOUTH CAROLINA: ANDERSON: Anderson, *Davis 8424* (Mo). GREENWOOD: Greenwood, *Bartram 3313* (ANS). LEXINGTON: Batesburg, *McGregor 66* (US). OCONEE: Clemson College, *House 2892* (Mo). GEORGIA: CLARKE: Athens, *Wiegand and Manning 3089* (G). DEKALB: Stone Mountain, *Small*, Sep. 1894 (Mo, NB). FLOYD: Rome, *Canby*, Oct. 1898 (Del, Mo). JASPER: Monticello, *Porter*, ann. 1846 (ANS). LAMAR: Barnesville, *Hamlin*, Aug. 1928 (UGa). MUSCOGEE: Columbus, *Boykin* (NB). RABUN: Tallulah Falls, *Small*, Sep. 1894 (Mo). RANDOLPH: Cuthbert, *Harper 1734* (G, Mo, NB). RICHMOND: Augusta, *Cuthbert*, Sep. 1898 (NB). ALABAMA: CHEROKEE: Center, *Leeds*, Oct. 1934 (ANS). CULLMAN: Cullman, *Eggert*, Sep. 1897 (CM, Mo, NB). JEFFERSON: Birmingham, *Vasey*, ann. 1878 (ANS). LEE: Auburn, *Earle and Baker*, Sep. 1897 (M, Mo, NB). MOBILE: *Graves 1194* (Mo). TUSCALOOSA: Tuscaloosa, *Johnson* (NB); *L. puberula* var. *glabella*, fid. A. Gray. MISSISSIPPI: HARRISON: Biloxi, *Tracy 4942* (CCD, NB). JACKSON: Ocean Springs, *Skehan*, Sep. 1895 (Mo). LAUDERDALE: Meridian, *Schuchert*, Oct. 1896 (NB). FLORIDA: DUVAL: Jacksonville, *Curtiss 5565* (Del, G, M, Mo, NYS). MANATEE: Terra Ceia Island, *Simpson 411* (G, NB). LOUISIANA: BOSSIER: Alden Bridge, *Trelease*, Oct. 1898 (Mo). KENTUCKY: BELL: Pine Mountain, *Kearney*, Sep. 1893 (G, M, Mo, NB). CARTER: Olive Hill, *Svenson 4409* (ANS, CCD, G). EDMONSON: Mammoth Cave, *Leeds*, Oct. 1934 (ANS). FAYETTE: Lexington, *C. W. Short* (W). HARDIN: Vertrees, *Pennell 13627* (ANS). LAUREL: London, *McFarland 251* (Mo). LINCOLN: Kings Mountain, *Pennell 13746* (ANS). LYON: Kuttawa, *Eggleston 5195* (NB). MC CREARY: Parkers Lake, *Pennell*

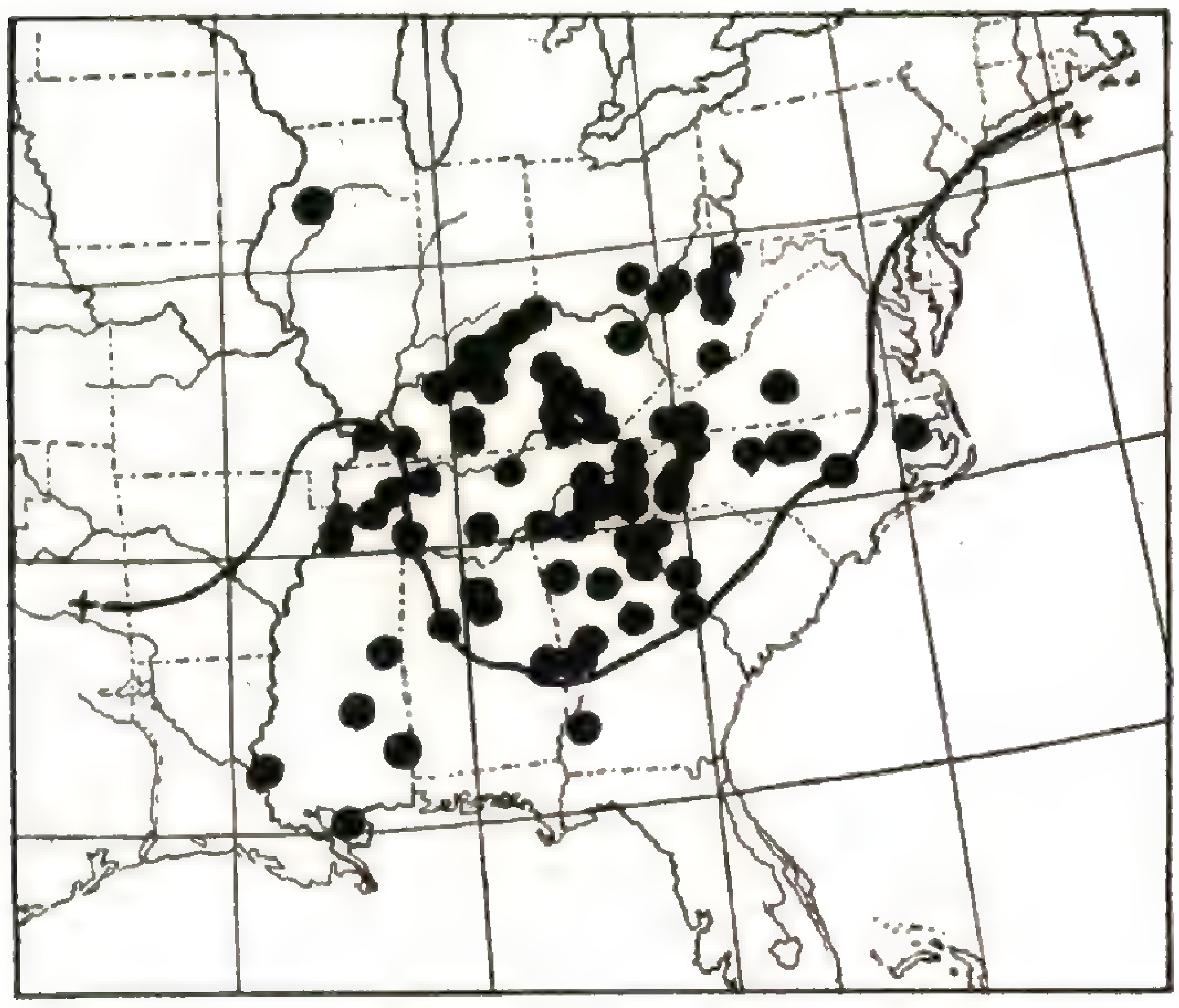

FIG. 12. Range of LOBELIA PUBERULA, Form A.

13801 (ANS). PULASKI: Floyd, *Pennell 13758* (ANS). WARREN: Bowling Green, *Price*, Jy. 1894 (Mo). TENNESSEE: BLOUNT: Chilhowee Mt., *Curtiss 1636* (ANS, CM, G, M, Mo, NB). CARROLL: Hollow Rock Jct., *Svenson 453* (ANS, G). CARTER: Roan Mt. Sta., *Rydberg 8180* (NB). COCKE: "Paint Rock to Del Rio," *Kearney 806* (M, Mo, NB). DICKSON: White Bluffs, *Eggert*, Aug. 1897 (Mo). FRANKLIN: Sewanee, *Eggert*, Sep. 1898 (Mo). HAMILTON: Chattanooga, *Lippincott*, Sep. 1895 (ANS). KNOX: Knoxville, *Ruth*, Sep. 1895 (M, Mo, W). MADISON: Jackson, *Bain 313* (NB). POLK: Reliance, *Pennell 14004* (ANS). PUTNAM: Cookeville, *Hudson 105* (R). SEVIER: "Great Smoky Mts.," *Schallert*, Sep. 1933 (NB). SHELBY: Memphis, *Fendler*, Sep. 1853 (G). TIPTON: Covington, *Rhoades*, Jy. 1927 (W). WAYNE: Waynesboro, *Svenson 4304* (ANS, G). OHIO: HOCKING: Queer Creek, *Griggs*, Aug. 1910 (G). INDIANA: CLARK: State Reserve, *Deam 5440* (CCD). CRAWFORD: Leavenworth, *Deam 18566* (CCD). DEARBORN: Manchester, *Deam 30126* (CCD). HARRISON: New Middletown, *Deam 18725* (CCD). JEFFERSON: Kent, *Deam 35293* (ANS). PERRY: Cannelton, *Deam 33211* (CCD). VANDERBURGH: Evansville, *Deam 33115* (CCD). ILLINOIS: HENRY: Galva, "*A. B.*" (Horner herb.) (G). JACKSON: Makanda, *Vasey*, Aug. 1862 (G). PULASKI: Karnak, *Palmer 16554* (ANS, Mo). UNION: Cobden, *Earle*, Sep. 1878 (CM).

b) Common on the southeastern Coastal Plain and adjacent Piedmont, New Jersey and Pennsylvania south to Georgia, is a plant distinguished by a densely long-hirsute calyx, with broad calyx-lobes (2.5–5.0 mm. wide by 5–12 mm. long), which are often undulate or crisped on the margins, with rounded auricles formed by the reflexed margins and the lobes of the cordate base. Bracts usually leafy, broad at the base, 1–2 cm. long; leaves more or less closely appressed to the stem, acute above, but usually obtuse and obovate below, often entire in outline or irregularly coarsely serrate, but not conspicuously callose-denticulate. Representative Material seen: GEORGIA: CHATHAM: Savannah, *Nuttall*, herb. J. Gay (G). LIBERTY: nr. Sunbury, *L. LeConte* (NB). WALTON: Loganville, *Small*, Sep. 1894 (NB). SOUTH CAROLINA: AIKEN: Aiken, *Ravenel*, Sep. 1866 (Mo). CHARLESTON: Charleston, *Backman* (ANS). NORTH CAROLINA: HALIFAX: Weldon, *Bartram*, Oct. 1908 (ANS, NB). PASQUOTANK: Elizabeth City, *Moldenke 108* (Duke, Mo, UP). ROWAN: Salisbury, *Heller*, Aug. 1890 (ANS, M, Mo, NB). VIRGINIA: ACCOMAC: Franklin City, *Brown*, Sep. 1907 (ANS). ARLINGTON: Fort Myer, *Mearns 134* (NB). FAIRFAX: Great Falls, *Wismer 433* (UP). JAMES CITY: Williamsburg, *Grimes 4434* (M); *4388* (G, NB). NORFOLK: Northwest, *Heller 744* (Mo). PRINCE GEORGE: New Bohemia, *Pennell 14426* (ANS). PRINCESS ANNE: Virginia Beach, *Heller 1335* (ANS, NB). DISTRICT OF COLUMBIA: *M. S. Bebb*, ann. ca. 1863 (ANS, G); Takoma Park, *House 1532* (Mo); *323* (NB). MARYLAND: ANNE ARUNDEL: Leon, *Shull 259* (Mo, NB). BALTIMORE: Catonsville, *Foreman*, ann. 1873 (NB). CECIL: North East, *J. P. Otis ? P479* (herb. R.R.T.).

KENT: Golts, *Brown*, Sep. 1907 (ANS). PRINCE GEORGES: Ammendale, *Bro. Hyacinth 1177* (Mo). QUEEN ANNES: Centerville, *Norton*, Jy. 1903 (Mo). WORCESTER: Snow Hill, *Moldenke 6618* (NB). DELAWARE: KENT: Little Creek, *Larsen 311* (UP). NEWCASTLE: Newark, *Commons*, Sep. 1869 (ANS). SUSSEX: Rehoboth, *Churchill*, Sep. 1908 (G). PENNSYLVANIA: CHESTER: Nottingham, *Bartram 1771* (ANS).

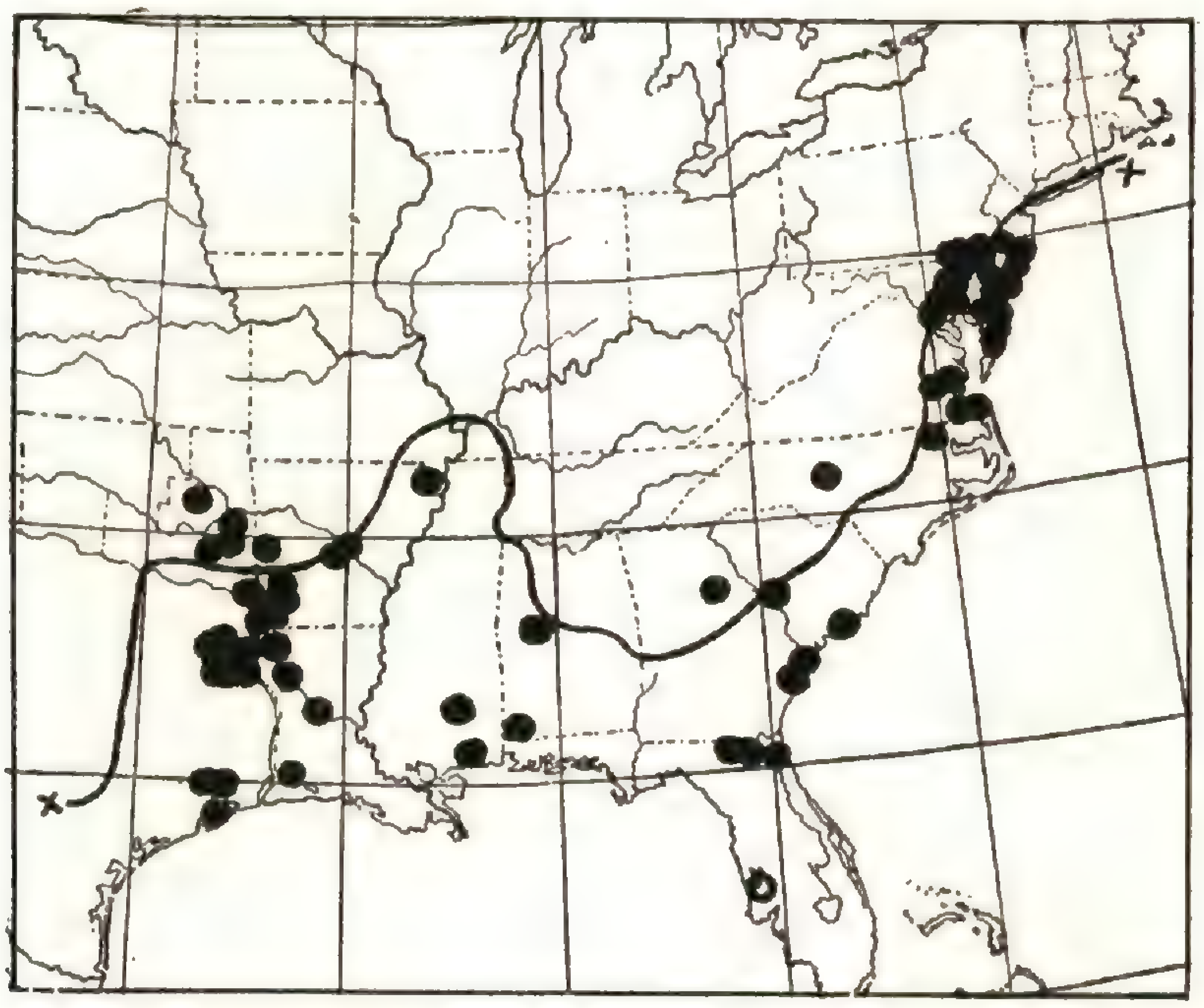

FIG. 13. Combined Ranges of Forms of LOBELIA PUBERULA, excepting Form A.

DELAWARE: Bethel-Concord line, *Pennell*, Oct. 1908 (ANS). LANCASTER: Pleasant Grove, *Small and Carter*, Sep. 1908 (ANS, NB). YORK: Castle Fin, *Crawford*, Aug. 1895 (ANS). NEW JERSEY: ATLANTIC: Leeds Point, *Gray*, Sep. 1833 (G). BURLINGTON: Hartford, *Long 4878* (ANS, UP). CAPE MAY: Cape May, *Mackenzie 4444* (CCD, G, Mo). CUMBERLAND: Bayside, *Fogg 7445* (ANS). OCEAN: Manahawkin, *Long*, Sep. 1909 (ANS).

c) In the southern states, Alabama to Louisiana, especially on the Coastal Plain, form (a) above becomes practically smooth. This has been called var. *glabella* Hooker, by American authors. Representative Material seen: ALABAMA: MOBILE: Theodore, *Pennell 4486* (UP). MISSISSIPPI: CLARKE: Shubuta, *Schuchert*, Oct. 1896 (NB). SCOTT: Forest, *Cook*, Aug. 1925 (US). WILKINSON: *Phares*, Sep. 1868 (Miss). LOUISIANA: ORLEANS: New Orleans, *Torrey* (G). TEXAS: VICTORIA: "Missions valley near the Guadeloupe River above Victoria," *Schott*, Oct. 1851 (NB); this plant is perhaps only a depauperate specimen of some other form of this species.

d) From Missouri and Arkansas southward to eastern Oklahoma and Texas, and eastward to Alabama and southern Mississippi

occurs a plant resembling that of the Atlantic Coastal Plain, but with large leafy *lanceolate* bracts (usually not broad at the base), the calyx often smoothish or merely strigose. Auricles well-developed and sepals broad. Leaves often hairy, more or less appressed to the stem or loose, often with conspicuous sharp small teeth, each callose-tipped.—*L. puberula* var. *mineolana* Wimmer in Fedde Rep. Spec. Nov. XXVI: 4. 1929.—Representative Material seen: ALABAMA: DALLAS: *Trelease*, ann. 1879 (Mo). WASHINGTON: Fruitdale, *A.G.J.*, Oct. 1903 (Mo). MISSISSIPPI: SMITH: Taylorsville, *Tracy*, Aug. 1903 (NB, US). LOUISIANA: CADDO: Shreveport, *Gregg*, Sep. 1847 (Mo). CALCASIEU: Lake Charles, *Mackenzie 528* (Mo, NB). NATCHITOCHES: Natchitoches, *Palmer 8714* (Mo, NB). RAPIDES: Alexandria, *Hale* (ANS). MISSOURI: DUNKLIN: *Bush*, Sep. 1893 (Del, G, Mo). ARKANSAS: HEMPSTEAD: Columbus, *Palmer 6838* (Mo). HOT SPRING: Malvern, *Palmer 8462* (Mo, NB). HOWARD: Baker Springs, *Kellogg*, Oct. 1899 (Mo). MILLER: Texarkana, *Palmer 14634* (Mo). POLK: Rich Mountain, *Trelease*, Oct. 1898 (Mo). PULASKI: Little Rock, *Demaree 8163* (CCD, G, Mo, NB); Little Rock, *Hasse*, ann. 1886 (M, NB, NYS); all material seen from Pulaski Co., seems to have rather large flowers. SALINE: Benton, *Greenman 4302* (Mo). OKLAHOMA: CREEK: Sapulpa, *Pennell 5395* (NB, UP). HASKELL: Sans Bois Mts., *Sheldon 310* (Del, NYS). LATIMER: Wilburton, *Stratton 603* (Mo). MC CURTAIN: Broken Bow, *Stratton 574* (Mo); this plant has oversize flowers. PITTSBURG: McAlester, *Sheldon 310* (Mo). TEXAS: *Drummond* (NB); *Lindheimer*, ann. 1843 (G). ANDERSON: *Palmer 10721* (Mo). AUSTIN "S. Felipe de Austin," *Drummond* (G); this is the *L. amoena* of A.DC., according to Asa Gray. BOWIE: Texarkana, *Heller 4166* (ANS, G, Mo, NB). BRAZORIA: Columbia, *Bush 1530* (Mo, NB). CHEROKEE: Jacksonville, *Palmer 8593* (Mo, NB). GREGG: Longview, *Eggert*, Aug. 1898 (Mo). HARRIS: Houston, *Lindheimer*, Sep. 1842 (Mo). HARRISON: Marshall, *Bush 782* (Mo). MONTGOMERY: Willis, *Warner* (Mo). PANOLA: Beckville, *Reverchon 3204* (G, Mo, NB). RUSK: "auf Prärien an Waldrändern," *Vinzent, tex. Pfl. 60* (Mo). SMITH: Tyler, *Reverchon 2086* (Mo). UPSHUR: Big Sandy, *Reverchon 3205* (G, Mo, NB). WOOD: Mineola, *Reverchon*, Aug. (Mo); presumably the type of var. *mineolana*.

In addition to the above, a few specimens have been seen of the plant designated as

L. PUBERULA, var. PAUCIFLORA Bush, Ann. Rep. Mo. Bot. Garden 17: 122. 1906.—TYPE LOCALITY: Swan, Smith Co., Texas. TYPE SPECIMEN: *Reverchon 3206*, Sep. 17, 1902; seen in Missouri Botanical Garden. Stems slender, densely white-pubescent. Leaves thin, oblong, hirsute. Calyx and pedicel densely long-hirsute. Flowers 3–15 in number, larger than in *L. puberula*. Filament-tube 8–11 mm. long. This plant seems quite distinct, and may deserve specific rank, but as so little material has been seen, it seems best to leave its status unchanged. Material seen: LOUISIANA: NATCHITOCHES: Natchitoches,

Palmer 8905 (NB). RAPIDES: Alexandria, *J. Hale* (G, Mo, NB). TEXAS: SMITH: Swan, *Reverchon 3206* (Mo).

(*To be continued*)

NOTES ON ROCKY MOUNTAIN PLANTS

Estelle H. Kelso

In Plants of the Rocky Mountain National Park, U. S. Dept. of the Interior, Natl. Park Service, 1–157. 1933, R. E. Ashton treated all the ferns and seed plants then known to occur in that area. The following is a list of plants found there which were not reported in that work. All collections and observations were made within half a mile of Bryson's Camp on Fall River unless otherwise stated. Numbers under 100 were collected by L. Kelso and the writer, higher numbers by the former.

Oryzopsis asperifolia Michx. Aspen groves and rocky slopes.

Stipa columbiana Macoun. Dry ground near Sheep Lake, June 18, 1933; no. 35.

Muhlenbergia filiformis (Thurb.) Rydb., var. **fortis**, var. nov. *Sporobolus simplex* Scribn., U. S. Dept. Agr. Div. Agrost. Bull. **11**: 48. 1898. *Muhlenbergia simplex* Rydb., Bull. Torr. Bot. Club **32**: 600. 1905. Not *M. simplex* Kunth, 1829.

Many plants of this species growing around Sheep Lake were consistently different from the typical form in having the stems 1 mm. or more thick, and the lemmas over 2 mm. long.

Alopecurus geniculatus L., var. aristulatus Torr. In shallow water along Bighorn Creek, August 5, 1931; no. 3554.

Avena Hookeri Scribn. Near Lawn Lake, August 5, 1931; no. 3662.

Poa reflexa Vasey and Scribn. Common in thickets of the aspen association in August.

Glyceria striata (Lam.) Hitch., var. stricta (Scribn.) Fernald. Common in damp ground along Fall River and Bighorn Creek during August.

Festuca Kingii (S. Wats.) Cassidy. Dry soil near Sheep Lake, June 18, 1933; no. 34.

Bromus secalinus L. Occasional in a pasture along Bighorn Creek.

Bromus brizaeformis Fisch. and Mey. Common in dry soil along roads.

Eleocharis palustris (L.) R. and S., var. major Sonder. Bog near Bryson's Camp, June 21, 1933; no. 42. Also grew along margin of Sheep Lake and near Cub Lake.

Eleocharis acicularis (L.) R. and S. Damp ground around Sheep Lake, August 4, 1931; no. 3660.

Carex Parryana Dewey. Damp meadows near Cascade Lodge, June 16, 1933; no. 73.

Carex nova Bailey. Occasional on grassy slopes near Lawn Lake.

Carex athrostachya Olney. Damp ground near Lawn Lake, August 5, 1931; no. 3616.

Carex heliophila Mackenzie. Common in inceptive and mixed grasslands below 9,000 feet.

Corallorhiza wyomingensis Hellmayr. Damp ground near Bighorn Creek.

Salix brachycarpa Nutt. Bogs near Cascade Lodge, alt. 8,500 feet, June 20, 1933; no. 1.

Salix Geyeriana Anders. Abundant along west margin of Sheep Lake and in bog near Cascade Lodge.

Stellaria longipes Goldie. Damp ground near Cascade Lodge, June 20, 1933; no. 9.

Aragallus deflexus (DC.) Heller. Common in thickets near streams.

Pediocactus Simpsoni (Engelm.) Britton and Rose. Occasional in mixed grassland.

Epilobium Hornemanni Reichenb. Bogs near Lawn Lake, August 5, 1931; no. 3557.

Epilobium ovatifolium Rydb. In spring near Cascade Lodge.

Myriophyllum verticillatum L., var. pectinatum Wallr. Sheep Lake, June 16, 1933; no. 71.

Veronica serpyllifolia L. Damp ground near Bryson's Camp, August 5, 1931; no. 3621.

Utricularia vulgaris L., var. americana A. Gray. Common in shallow water near Cub Lake.

Plantago asiatica L. Found in golf course near Estes Park.

Galium Aparine L. Common in the aspen association along Fall River.

Galium trifidum L. Occasional in damp ground near Fall River.

Erigeron trifidus Hook. Occasional on rocky slopes near Bryson's Camp.

Petasites sagittatus (Pursh) A. Gray. Damp ground near Bryson's Camp, alt. 8,300 feet, June 21, 1933; no. 22.

Senecio canus Hook., var. Purshianus (Nutt.) A. Nels. Occasional on rocky slopes near Lawn Lake.

Senecio saxosus Klatt. Occasional on rocky slopes near Fall River Pass.

Cirsium americanum (A. Gray) K. Schum. Along road up north side of Long's Peak.

Cirsium Hookerianum Nutt. Occasional on rocky slopes above Ypsilon Lake and Lawn Lake.

Tragopogon pratensis L. Occasional along lower part of trail to Ypsilon and Lawn Lakes.

To the above may be added 3 plants recently described from the park, Atragene Columbiana Nutt., f. albescens E. H. Kelso, Rhodora **35**: 347. 1933, Salix pseudolapponum v. Seeman, var. subincurva E. H. Kelso, l. c. **36**: 195. 1934, and Castilleja flavo-viridis L. Kelso, Madrono **1**: 241. 1929.

Washington, D. C.

Prenanthes crepidinea in western New York.—In 1882, in his *Plants of Buffalo and its Vicinity*, David F. Day recorded *Prenanthes crepidinea* Michx. as

Very rare. Wheelbarrow Pt., Buffalo. Only two plants seen, and those not lately. Some doubt exists as to the species, but it surely better corresponds with *P. crepidina* than with any other described in Gray's Manual.

Subsequently further doubt has been expressed regarding the occurrence of the species in western New York. Thus House, in his *Annotated List of the Ferns and Flowering Plants of New York State*, says (p. 674), under *Nabalus crepidineus* (Michx.) DC.: "Reported from Western New York. Authentic records are lacking," and Zenkert, in his *Flora of the Niagara Frontier Region* (p. 268), after quoting Day's statement, added the comment: "No corresponding herbarium specimens have been found, nor has the species been collected in recent years."

In 1843 Torrey & Gray had seen no specimens from east of Ohio; but in the Gray Herbarium there is a beautifully characteristic sheet of *P. crepidinea* correctly identified by Gray and marked in his hand: "New York: Buffalo, *Prestele*, 1844." For some inexplicable reason Gray, in the *Manual* (1848) merely took the eastern limit (Ohio) from Torrey & Gray, and the occurrence of the plant at Buffalo in 1844 was overlooked in his work until the preparation of the *Synoptical Flora*, the part covering the *Compositae* printed in 1884.—M. L. Fernald.

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Rhodora

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 38. September, 1936. No. 453.

COLOR VARIATION IN EASTERN NORTH AMERICAN FLOWERS AS EXEMPLIFIED BY HEPATICA ACUTILOBA

Edgar Anderson

The study of color variation in *Hepatica acutiloba* was undertaken because this species presents marked variation in color and can often be collected in sufficient numbers to give reliable averages. A preliminary report[1] presented data from plants studied along the Narrows of the Big River near Eureka, Missouri. Dr. Ledyard Stebbins very kindly made a census of 191 plants from a maple woods near Hamilton, New York and I personally was able to study 42 plants in a rocky, hardwood forest at Fairlee, Vermont. As in the first communication on the subject, two characters were recorded for each plant, sepal number and flower color.

Sepal number. The plants from New York and Vermont had very slightly higher averages for sepal number (7.3 and 6.9 respectively) than did those from Missouri (6.2). Aside from this slight difference in averages, the three collections were remarkably similar in so far as sepal number was concerned. Figure 1 demonstrates the similarity of the frequency distributions for the three localities.

Flower color. Flower color presented a very different picture from sepal number. There was a pronounced gradient in color and color intensity between Missouri and Vermont, the latter region having a strong tendency to whites and very pale-colored flowers, the former to brighter, stronger colors. Flowers are scored as whites, pinks, and blues. With a little practice this can be done quite reliably. The true whites have no trace of pink or blue in the bud; they have at most a cream or yellowish-green tone. The pinks are sometimes diffi-

[1] Anderson, Edgar. Rhodora 35: 66–67. 1933.

cult if not impossible to distinguish from the whites, when the flowers have opened, but in the bud there is a pronounced flush of pink particularly at the bases and edges of the sepals. Blues and pinks are very easily separated aside from an occasional magenta-flowered plant. These magentas (two or three in all) have been scored with the pinks. The scoring for deepness of color is unfortunately not quite as objective, three classes being recognized, "very faint," "faint," and "deep." Into the first go those flowers which show color only in the bud, being

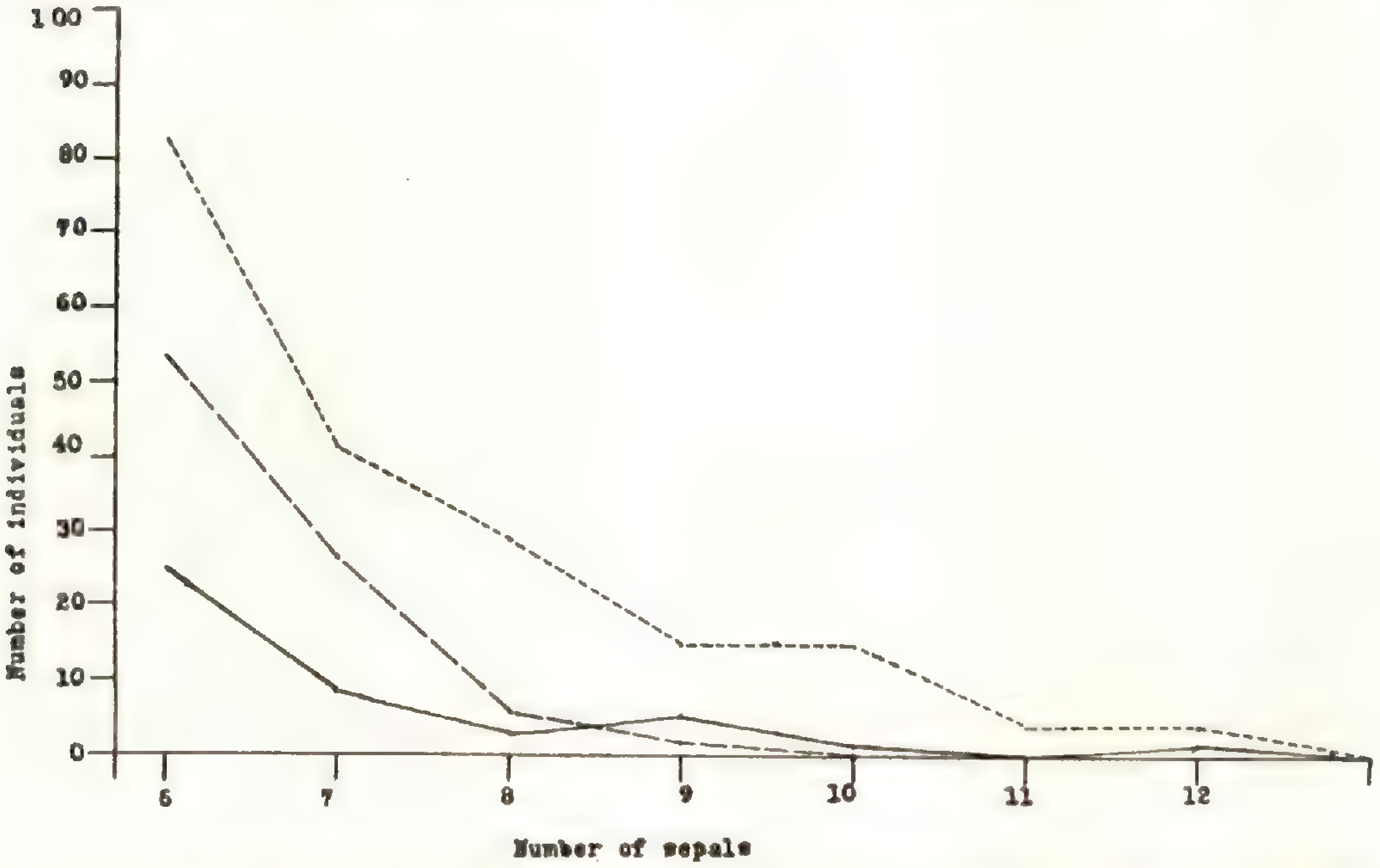

FIG. 1. Variation in Number of Sepals in *Hepatica acutiloba* from Hamilton, New York (dotted line); Eureka, Missouri (dashes); and Fairlee, Vermont (solid line).

practically white when full blown. The division into the remaining two classes is purely subjective.

The data for the three localities are presented in TABLE 1. The actual figures are given as well as percentages, the latter being in brackets. The general geographical trend in flower color from the Ozarks to New England is plainly shown. The percentages of blue, of white and of faint-colored all demonstrate the same tendency. Blue, which in Missouri makes up over a third of the population, falls to less than an eighth in Vermont. White, which, on the other hand, is altogether lacking in Missouri, represents one-sixth of the New York collection and over a third of that from Vermont. The same general tendency is demonstrated, though less objectively, when the figures for percentages of faint color are examined.

NARROWS OF THE BIG RIVER, MISSOURI

	very faint	faint	deep	total
pink	16	24	8	48 [65]
blue	0	13	13	26 [35]
white	0	0	0	0
total	16 [21.6]	37 [50]	21 [28.4]	74

HAMILTON, NEW YORK

	very faint	faint	deep	total
pink	40	49	14	103 [54]
blue	10	23	18	51 [26.7]
white	37	0	0	37 [19.3]
total	87 [45.6]	72 [37.7]	32 [16.7]	191

FAIRLEE, VERMONT

	very faint	faint	deep	total
pink	15	7	0	22 [52.4]
blue	0	4	1	5 [11.9]
white	15	0	0	15 [35.7]
total	30 [71.4]	11 [26.2]	1 [2.4]	42

TABLE 1. Variation in flower color of HEPATICA ACUTILOBA from three localities. Figures in brackets are percentages.

The figures for these three collections, therefore, demonstrate a geographical gradient in color between the Green Mountains and the Ozarks for *Hepatica acutiloba.* While further study will be necessary to confirm these results, partial confirmation can be found in the opinions of naturalists familiar with the vernal flora of the two regions. In the opinion of several such naturalists, the results reported above are indicative of a general relationship. The greater brilliance of the spring flora of the Ozarks is not entirely a matter of different species. In several instances, at least, when the same species appears in the spring flora of the two regions, the Ozark form is brighter in color. *Viola pedata* is commonly represented in New England only by the self-colored variety, *Viola pedata* var. *lineariloba.* In the Ozarks the much more brilliant bicolored flowers of the type are found accompanying the self-colored ones of the variety. The flowers of Dutchman's Breeches, *Dicentra Cucullaria* (L.) Bernh., as seen in New England, are usually white or cream-colored. In the Ozarks they are suffused with pink.

Within New England itself there is a tendency towards a greater frequency of white and pale-flowered forms as one approaches the White Mountains. *Cypripedium acaule* Ait., for instance, is bright

pink to pale pink in southern New England but in the neighborhood of the White Mountains *Cypripedium acaule* Ait. f. *albiflorum* Rand & Redfield becomes so common as actually to replace it in certain areas.[1]

For the paler colors found in *Hepatica acutiloba* and in other species in New England as compared with the Ozarks, and for the greater frequencies of albinos in the vicinity of the White Mountains, one might offer two quite different explanations. Both depend upon the fact that the New England forests are denser and shadier than the upland forests of the Ozarks and that within New England they become progressively shadier towards the mountains, culminating in the deep shade of the spruce forests of that region. By the first explanation the paler-flowered forms would be the direct result of generations of existence within this shady environment. Though such an explanation might immediately be advanced by many naturalists, it finds little support in experimental biology. An explanation more fully in accord with the facts of variation and heredity is that in this case, as in many others, the environment affects the organism indirectly by selection. In the deep woods, as at dusk, white flowers are more conspicuous than colored ones. In the full blaze of the sun they are less so. Selection, therefore, operates differently in the two environments, and from the same basic stocks produces bright-flowered races in the sunny Ozark woodlands and white-flowered and pale-tinted ones in the shadier New England forests.

MISSOURI BOTANICAL GARDEN.

ASPLENIUM PLATYNEURON (L.) OAKES, VAR. **bacculum-rubrum** (Featherman), comb. nov. *A. ebeneum*, var. *Bacculum Rubrum* Featherman, Rep. Bot. Surv. So. Centr. La. 1870: 75 (1871). *A. platyneuron*, var. *euroaustrinum* Fernald in RHODORA, xxxvii. 382, pl. 384, figs. 1 and 2 (1935).

Mr. Weatherby unkindly calls my attention to the publication of the variety of Americus Featherman, whose plant (as the name was intended to indicate) came from near Baton Rouge. There seems to be no question that Featherman had the large extreme with discrete sori described by me.—M. L. FERNALD.

[1] Pease, A. S. Proc. Bost. Soc. Nat. Hist. 37: 216. 1924.

STUDIES IN THE TAXONOMY AND DISTRIBUTION OF THE EASTERN NORTH AMERICAN SPECIES OF LOBELIA

Rogers McVaugh

(*Continued from page 298*)

9. L. spicata Lamarck, Dict. Bot. III: 587. 1789. This is a species with at least five well-defined phases, which may be distinguished as follows:

a) Var. leptostachys (A. DeCandolle) Mackenzie & Bush, Fl. Jackson County, Mo. 183. 1902.—Type Locality: "in Carolina merid." Type Specimen: The plant described by DeCandolle as *L. leptostachys* was seen by him in the herbarium of Asa Gray, collected by Fraser. This has not been seen, but there is in the New York Botanical Garden a specimen collected at Lincolnton, N. C., by the Rev. M. A. Curtis, which was verified by Asa Gray, and is also marked "*Lob. leptostachys* A.DC. Genève 1839."—*L. leptostachys* A. DeCandolle, Prodr. Syst. Veg. VII: 376. 1839. *L. bracteata* Small, Fl. S.E.U.S. 1146. 1903.—Stem strict, unbranched, 30–120 cm. high, dark purplish-red and densely short-pubescent near the base, becoming smooth and light green above; often pubescent on the angles formed below the decurrent leaf-bases. Cauline leaves 10–40, usually quite close together and somewhat appressed to the stem, thus giving them an imbricated appearance in dried material; firm or leathery in texture; sessile, or the lowest narrowed to short petioles; the lower and middle ones obtuse, long-oblong or oblanceolate, to 2.5 × 12 cm., appearing sub-entire, but beset with callose-glandular teeth along the margins. Upper leaves gradually smaller, becoming definitely bract-like (lance-acute), and merging into the bracts of the inflorescence. Basal leaves usually few or none; if present, oblanceolate, obtuse. All leaves strigose-pubescent above and below, especially the lower

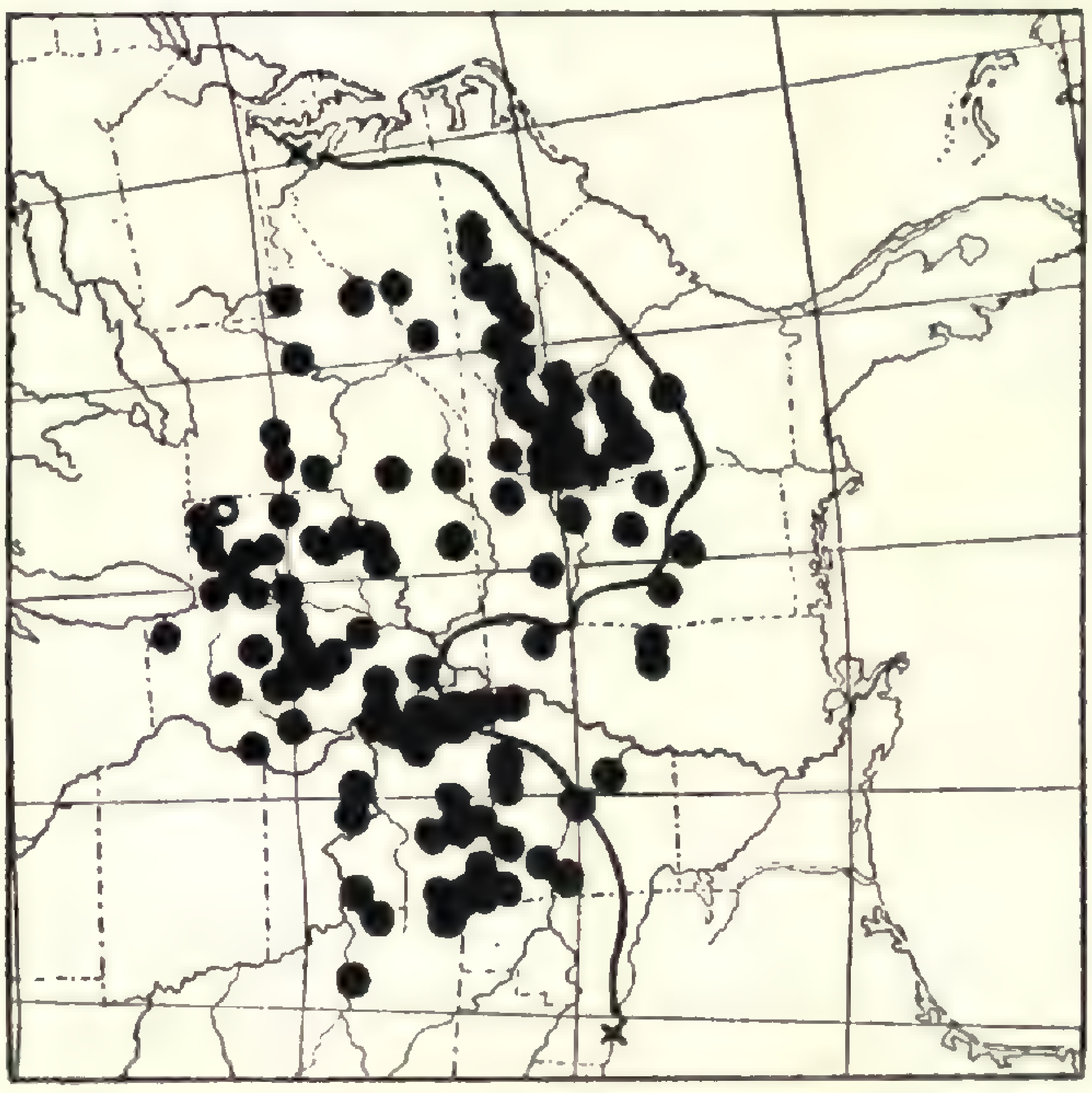

Fig. 14. Range of Lobelia spicata, var. leptostachys.

leaves and near the margins. Plants, when dried, often with a characteristic brownish-green color. Inflorescence a terminal virgate spike 20–30 (50) cm. long, densely flowered, not noticeably secund, bearing 20–200 (ave. 30–60) flowers upon very short (in fruit 2–4 mm.) rough-puberulent curved pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts ciliate-pubescent or sometimes smooth, lanceolate, acute, sometimes linear-lanceolate, usually conspicuous, 1–4 cm. long. Calyx in anthesis flattish or conic, smooth or pubescent, becoming hemispheric in fruit, strongly ribbed, about 3.5 mm. in diameter. Capsule ½–⅔ inferior. Calyx-lobes subulate or linear-lanceolate, (2) 3–6 (7) mm. long, bristly-ciliate especially near the tips, or smooth; auricles at the base of each lobe filiform, 1–3 (5) mm. long, deflexed. Flower 9–12 mm. long, including calyx. Corolla light blue, smooth or pubescent outside, the lower lip pubescent at the base inside. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate, not sharply reflexed, slightly shorter than the tube; two upper lobes lanceolate, curved upward. Filament-tube 3.0–3.5 mm. long, pubescent below, connate above about half its length. Anther-tube 1.8–2.0 mm. long, light bluish-gray, the two smaller anthers each with a tuft of white hairs at the tip, the three larger usually pubescent on the backs.

While this plant in its most characteristic state seems wholly distinct from var. *originalis* and var. *hirtella,* it is separated from them by no constant characters, and where the ranges of any of the three overlap, puzzling intermediates are frequently encountered. "Typical" var. *leptostachys* differs from var. *originalis* by the longer auricles, shorter pedicels (and consequently narrower spikes), somewhat longer, denser inflorescences, longer bracts, leaves thicker, longer, more numerous, more nearly entire, more appressed; somewhat heavier pubescence. It differs by similar characters from the pubescent var. *hirtella.* However, many specimens from Illinois, Missouri, Iowa, can be referred to no one of the three; all the distinguishing characters break down. In consequence, it seems best to consider all three as varieties of the same species (See FIG. 19).

Dry sandy woods and hillsides, northern West Virginia to central Alabama, west to northern Illinois, eastern Kansas and western Arkansas. Rare or absent on the eastern Coastal Plain; occasional on the Gulf Coastal Plain in Alabama, Mississippi, Arkansas and western Tennessee. Flower June 20–August 1. Representative Material seen: VIRGINIA: MONTGOMERY: *Leidy,* Jy. 1867 (ANS, UP). SMYTH: Chilhowie, *Small,* Aug. 1892 (NB). WEST VIRGINIA: GREENBRIER: Lewisburg, *Gray 282* (CM). MONONGALIA: "Morgantown, Va.," *Dr. Paddock,* Short herb. (W). WOOD: Leachtown, *Millspaugh 304* (NB, WVa). NORTH CAROLINA: BUNCOMBE: Biltmore, *Biltmore herb. 625b* (G, M, Mo, NB, UP, US, W). CALDWELL: Hudson, *Randolph 1131* (G). CHEROKEE: Andrews, *Huger,* Sep. 1900 (NB). DURHAM: Durham, *Blomquist 5023* (Duke). FORSYTH: Winston-

Salem, *Schallert*, Jy. 1911 (Duke). HAYWOOD: *Ashe*, Sep. 1893 (NC). IREDELL: Statesville, *Hyams* (M). LINCOLN: Lincolnton, *Curtis* (ANS, NB). ORANGE: Hillsborough, *M. A. Curtis ?* (G). POLK: Columbus, *Townsend*, Oct. 1897 (US). ROWAN: Salisbury, *Heller 108*, Jun. 28, 1890 (ANS, Mo, NB). SWAIN: Great Smoky Mts., *Hemingway*, Aug. 1891 (WVa). SOUTH CAROLINA: PICKENS: nr. Clemson College, *House 2957* (US). GEORGIA: BALDWIN: "Georgia, *Dr. Boykin*," Torrey herb. (NB). CLARKE: Princeton, *Miller and Maguire 1489* (CU). CLAYTON: dry woods, *Harper 230* (G, Mo, US). COBB: *Wilson 33* (G, Mo, US). DEKALB: Stone Mt., *Eggert*, Jy. 1897 (Mo). FANNIN: Blue Ridge Mts., *H. H. Smith 2533* (W). FLOYD: W. Rome, *Pennell 4079* (UP, NB). GWINNETT: McGuire's Mill, *Small*, Jy. 1893 (Mo, US). HABERSHAM: Clarkesville, *J. D. Smith*, Sep. 1883 (G, US). WALKER: Lookout Mt. (no Co. given), *Ruth*, Jy. 1898 (Mo, NB, US). ALABAMA: AUTAUGA: Prattville, *Mohr*, Jy. 1880 (US). BLOUNT: *Mohr*, Jun. 1883 (US). CLAY: Millerville, *Pollard and Maxon 169* (NB). JACKSON: Scottsboro, *Earle*, Jun. 1899 (NB). TALLADEGA: Riddell's Mill, *Mohr* (US). TUSCALOOSA: Tuscaloosa, *Mohr*, Oct. 1879 (US). MISSISSIPPI: LOWNDES: Mayhew, *Donald*, Jun. 1927 (W). OKTIBBEHA: Starkville, *Phares*, ann. 1883 (Miss). KENTUCKY: FAYETTE: Lexington, *C. W. Short*, ann. 1836 (NB). PULASKI: Burnside, *Pennell 13795* (ANS). WARREN: Bowling Green, *Price*, Jun. 1897 (Mo). TENNESSEE: BRADLEY: Cleveland, *Leeds*, Jun. 1929 (ANS). CHESTER: Henderson, *Bain 214* (NB). COFFEE: Tullahoma, *Gattinger*, Jy. 1880 (Del). CUMBERLAND: Daysville, *Anderson 1401* (G). HAMILTON: Lookout Mt., *Vasey*, ann. 1878 (ANS, US). KNOX: Knoxville, *Ruth*, Jy. 1895 (ANS, M. W). OHIO: CLARK: Springfield, *Williams* (Mo). HAMILTON: Cincinnati, *Lea* (ANS, NB). MONTGOMERY: Dayton, *Morgan*, Jy. 1879 (NB, US). INDIANA: BENTON: Barce, *Deam 11857* (CCD). BROWN: Belmont, *Deam 43459A* (CCD). CASS: Cicott, *Deam 25899* (ANS). FOUNTAIN: Fountain, *Deam 25819* (CCD). HARRISON: Elisabeth, *Deam 20529* (CCD). HENRY: Springport, *Deam 45344* (CCD). KOSCIUSKO: Winona Lake, *Deam 422* (CCD). LAWRENCE: Mitchel, *Deam 17263* (CCD). MARSHALL: Culver, *Deam 9017* (CCD). NEWTON: Thayer, *Deam 50607* (CCD). NOBLE: Albion, *Deam 20751* (NB). PERRY: Derby, *Deam 11534* (CCD). TIPTON: Kempton to Goldsmith, *Deam 13630* (CCD). WASHINGTON: Campbellsburg, *Deam 37154* (CCD). WHITE: Burnettsville, *Deam 39340* (ANS). ILLINOIS: CASS: Beardstown, *Geyer*, Jy. 1842 (ANS, G, Mo, NB, W). CHAMPAIGN: *Raymond*, Jy. 1869 (W). CHRISTIAN: Taylorville, *Andrews*, Aug. 1898 (CU). HANCOCK: Augusta, *Mead*, Jy. 1847 (NB). LOGAN: Lincoln, *Mills*, Jy. 1899 (G). MC LEAN: Hendrix, *Robinson*, Aug. 1904 (G). MASON: Havana, *Gleason*, Aug. 1903 (G). MENARD: Athens, *Hall*, ann. 1861 (G, US). PEORIA: Peoria, *Brendel* (NYS). ST. CLAIR: French Village, *Eggert*, Jy. 1886 (Mo). SHELBY: Windsor, *Gleason 748* (G). UNION: Cobden, *F.S.E.*, Jun. 1879 (CM). MISSOURI: "upper Missouri," *Geyer*, ann.

1835 (Mo). BARRY: Eagle Rock, *Bush 113* (G, Mo, NB, US). BOONE: W. Webster, *Drunshel* (?) *1788* (Mo). BUTLER: Poplar Bluff, *Eby*, Jy. 1893 (Mo). CALLAWAY: McCredie, *Schwab*, Jy. 1924 (UP). DENT: Rhyse, *Kellogg 15309* (Mo). DUNKLIN: Pine City, *Bush 433* (Del, Mo). FRANKLIN: Gray Summit, *Kellogg 1212* (Mo). GREENE: Springfield, *Dewart 30* (Mo). IRON: Hogan, *Russell*, Jy. 1898 (Mo). JASPER: Webb City, *Palmer 924* (Mo). JEFFERSON: Kimmswick, *Engelmann*, Aug. 1866 (Mo). MC DONALD: *Bush*, Jy. 1893 (Mo). MADISON: Mine La Motte, *Eggert*, Jun. 1898 (Mo). NEWTON: Neosha, *Wilkens 2512* (ANS). PHELPS: Jerome, *Kellogg*, Jy. 1912 (Mo). ST. LOUIS: St. Louis, open woods, *Engelmann*, Jy. 1842 (Mo). SHANNON: Montier, *Bush 6128* (Mo). TANEY: Swan, *Bush 3437* (G, Mo). WASHINGTON: Irondale, *Glatfelter herb.*, Aug. 1895 (Mo). WEBSTER: Marshfield, *Partridge*, Jy. 1908 (W). WRIGHT: Mansfield, *Palmer 6240* (Mo). ARKANSAS: BAXTER: Cotter, *Palmer 5964* (Mo). BENTON: *Plank*, ann. 1899 (in part) (NB). CARROLL: Eureka Springs, *Palmer 4407* (Mo). FRANKLIN: Ozark, *Palmer 8148* (Mo, NB). FULTON: Mammoth Spring, *Demaree 5273* (US). JEFFERSON: Jefferson Springs, *Pennell 10668* (ANS). PULASKI: Little Rock, *Coville 64* (US). SEBASTIAN: Fort Smith, *Bigelow*, ann. 1853–4 (US). WASHINGTON: Fayetteville, *Harvey 54* (ANS, CM, M, Mo). KANSAS: CHEROKEE: *Hitchcock 752* (G, Mo, NB, R, US). MIAMI: Paola, *Oyster*, Aug. 1879 (Mo).

b) Var. **originalis.** TYPE LOCALITY of *L. spicata* Lamarck: Canada. TYPE SPECIMEN: In the Museum National d'Histoire Naturelle in Paris; the following description of it was furnished by Professor F. Gagnepain: "Anthères pales, à peine plus colorées (bleuâtres) que les filets. Sépales longs de 3.5–4 mm., complètement glabres, sans aucun cil, à oreillettes nulles. Calice égalant moitié du bouton à la veille de l'anthèse, dressé, puis un peu étalé à l'épanouissement de la fleur." (FIG. 25).—Not *Rapuntium foliis oblongis villosis* of the "Flora Virginica," as stated by DeCandolle (Prodr. VII: 374). This is probably *L. puberula* Mx.; Gronovius (1762) states that this plant (*Clayton n. 669*) flowers in September, which seems to rule out *L. spicata*. *L. spicata* Lamarck, Dict. Bot. III: 587. 1789. *L. Claytoniana* Michaux, Fl. Bor. Am. II: 153. 1803. Michaux also states that this is a synonym for Clayton's plant mentioned above. *L. goodenioides* Willdenow, Hort. Berol. I: plate 30. 1806. *L. pallida* Muhlenberg, Cat. Pl. Am. Sept. 22. 1813. Muhlenberg gives this name as a synonym for *L. goodenioides* Willd., but the material in the Muhlenberg herbarium, at the Academy of Natural Sciences of Philadelphia, is in such poor condition that it is impossible to determine the identity of *L. pallida*. *L. nivea* Rafinesque, Annals of Nature I: 15. 1820. *L. spicata* var. *parviflora* Gray, Syn. Fl. 6. 1878.—Stem strict, unbranched (rarely a few slender upright axillary branches bearing a few flowers), 20–110 cm. high, dark purplish-red and densely short-pubescent near the base, becoming smooth and light green above, made angular by the decurrent leaf-bases. Cauline leaves

3–20, usually not appressed to the stem, thin, sessile, or the lower narrowed into short margined petioles; the lower obtuse, oblanceolate, oblong or obovate, as large as 2.5 × 10 cm., shallowly coarse-dentate or sub-entire. Upper leaves gradually smaller, acute-lanceolate, often becoming more conspicuously denticulate above, and sometimes merging imperceptibly into the bracts of the inflorescence. All leaves strigose-pubescent above and below, especially near the margins and near the base of the plant. Basal leaves, if present, obovate, obtuse, pubescent, 1–12, narrowed into well-defined petioles. Inflorescence a

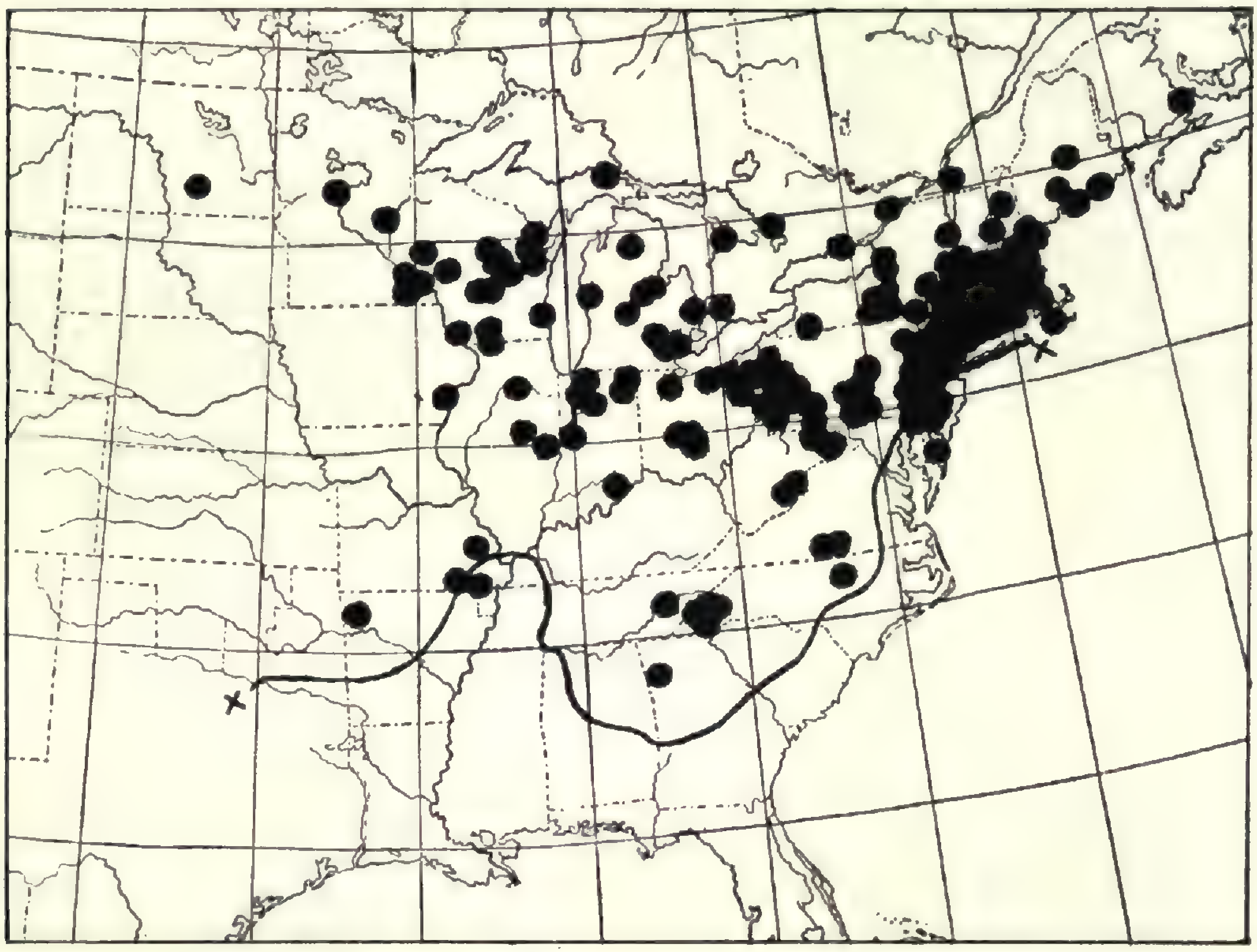

Fig. 15. Range of Lobelia spicata, var. originalis.

terminal virgate spike, 20–30 (60) cm. long, usually less than half the height of the plant, interrupted, not noticeably secund, bearing few–100 (in cases of fasciation 200 or more: the average is 30–60) flowers upon short (in fruit 5–8 mm.), slender, rough-puberulent pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts smooth (rarely ciliate-pubescent), narrowly lance-linear, about equalling the pedicels, or larger below, lanceolate, to 2.5 cm. long. Calyx in anthesis flattish or broad-conic, smooth or sparingly pubescent, becoming hemispheric in fruit, strongly ribbed, about 3.5 mm. in diameter. Capsule ½–⅔ inferior. Calyx-lobes subulate to deltoid, usually flat, 2.0–7.5 mm. long, smooth or somewhat bristly-ciliate; auricles usually present at the base of each lobe, distinctly short-triangular, or longer; in extreme cases filiform, as long as 1.0 mm.;

sometimes lacking. Flower 9–12 mm. long, including calyx. Corolla white to dark purplish-blue, smooth outside, the lower lip pubescent at the base inside. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate, slightly shorter than the tube, not sharply reflexed; two upper lobes lanceolate, curved upward. Filament-tube 3.0–3.5 (in extremes 2.5–4.0 mm.) mm. long, pubescent below, connate about half its length above. Anther-tube 1.7–2.0 mm. long, light bluish-gray, the two smaller anthers each with a tuft of white hairs at the tip; the three larger smooth or merely pubescent on the backs. Style included in anther-tube. Meadows and thickets, preferring moist, rich soil (frequently in pastures and hayfields; becoming rather weedy); New Brunswick to Pennsylvania, and south in the mountains to Georgia; west to northern Michigan, eastern Minnesota and eastern Missouri; southern North Dakota; north-western Arkansas. Intergrading freely in the western part of its range with the vars. *hirtella* and *leptostachys*. Occasional plants in the Eastern States which are referred to var. *hirtella* seem rather to be more or less ciliate variants of typical var. *originalis*. Flower June 15–August 1, apparently a few days earlier along the Atlantic Seaboard. Representative Material seen: New Brunswick: westmoreland: Moncton, *Brittain*, herb. G. S. Can. 15266 (O). Quebec: hull: Hull, *Harrington*, Jy. 14, 1905 (Toronto). rouville: Abbotsford, *Knowlton*, Aug. 1923 (G, Mo). Ontario: bruce: Big (=Dorcas) Bay, *Krotkoff 7835* (Toronto). essex: Sandwich, *Macoun 724* (Toronto); *Macoun* (herb. G. S. Can. 88020) (O). grenville: *Thomson*, Jy. 1896 (Toronto). middlesex: London, *Millman*, Jun. 1879 (Toronto). muskoka: Port Sydney, *Ivey*, Aug. 7, 1907 (Toronto). Maine: androscoggin: South Poland, *Furbish*, ann. 1893, 1896, 1897 (NE). cumberland: Cumberland, *Chamberlain*, Jy. 1903 (US, W). franklin: Farmington, *Anderson 684* (Toronto). hancock: Mt. Desert, fields, *Redfield*, Jy. 1885 (ANS, NE). kennebec: Augusta, *E. C. Smith*, Jy. 1886 (Mo, NE). lincoln: Bristol, *Chamberlain*, Jy. 1896 (NE). oxford: Rumford, *Parlin*, Jy. 1889 (NE). piscataquis: Dover, *Fernald 311* (G, Mo, NB, NE, US, W). washington: Machiasport, *Knowlton*, Jy. 1932 (NE). york: Kennebunk, *Hill 107* (CU). New Hampshire: carroll: E. Wolfboro, *J. H. Fassett*, Jy. 1926 (W). cheshire: Jaffrey, *Robinson 231* (G, NE). coös: Gorham, *Pease 16706* (NE); perhaps nearer var. *hirtella*. grafton: Hanover, *Williams*, Jy. 1910 (G). hillsborough: Peterboro, *Batchelder*, Jy. 1913 (US). merrimack: Hooksett, *Batchelder*, Jy. 1921 (NE). rockingham: Derry, *Batchelder*, Jy. 1913 (NB, NE). Vermont: bennington: Manchester, *Day 121* (G, US). caledonia: Lyndon, Jy. 21, 1873 (NB). orange: Fairlee, *Denslow*, Jy. 1923 (NB). rutland: Clarendon, *Eggleston 1423* (NB, US). windham: Vernon, *Robinson*, Aug. 1898 (G). windsor: Queechee Gulf, *Kennedy*, Jy. 1890 (G). Massachusetts: berkshire: Stockbridge, *Hoffmann*, Aug. 1902 (NE). bristol: Swansea, *Sanford 10336* (part) (NE); Dartmouth, *Fernald 1068* (part)

(NE). DUKES: Chilmark, *Harris*, Jy. 1898 (NE). ESSEX: *Oakes* (G, Mo, US). FRANKLIN: Buckland, *Forbes*, Aug. 1908 (NE). HAMPDEN: Granville, *Seymour 396* (G). HAMPSHIRE: Prescott, *Goodale et al.*, Jy. 1931 (NE). MIDDLESEX: Framingham, *Eames*, Jy. 1906 (CU, UP). NORFOLK: Grantville, *Boott*, Jy. 1854 (NE). PLYMOUTH: Bridgewater, *Cushman*, Jy. 1908 (W). SUFFOLK: Revere, *Young*, Jy. 1877 (NE). WORCESTER: Webster, *Knowlton*, Jy. 1903 (NE). RHODE ISLAND: BRISTOL: Barrington, *Sanford 10327* (NE). KENT: Warwick, *Fernald*, Jun. 1910 (G, NE). NEWPORT: Middletown, *Simmons*, Jy. 1898 (NE). PROVIDENCE: Providence, *Thurber*, Jun. 1844 (G). CONNECTICUT: FAIRFIELD: Greenwich, *Cushman and Sanford 1129* (NE, W). HARTFORD: Southington, *Bissell*, Jy. 1897 (part) (Mo). LITCHFIELD: S. Canaan, *Greenman 1423* (Mo). NEW HAVEN: New Haven, *Safford 223* (US). NEW LONDON: Franklin, *Woodward*, Jy. 2, 1906 (G). NEW YORK: ALBANY: Elsmere, *House 18401* (CU). BROOME: Binghamton, *Millspaugh*, Jy. 1881 (CM). CATTARAUGUS: Quaker Bridge, *Alexander*, Aug. 1926 (NYS). CHEMUNG: Elmira, *Lucy 12125* (NB). CHENANGO: Brisben, *Coville*, Jun. 27, 1887 (US). COLUMBIA: Kinderhook, *McVaugh 2673* (CU, NYS, UP). DELAWARE: Bovina, *Hoy*, Jy. 1892 (CU). DUTCHESS: Stissing Mt., *McVaugh 2862* (CU, NYS, UP). ESSEX: Minerva, *House 15172* (NYS). GREENE: Platte Clove, *Williamson*, Jy. 1903 (ANS). HAMILTON: Back Log Camp, *M. E. Leeds 1748* (ANS). LEWIS: Castorland, *Hotchkiss 2667* (NYS). ONEIDA: Forestport, *Haberer 2865* (G). ORANGE: Port Jervis, *Mackenzie 4175* (Mo, NB). OSWEGO: Fulton, *DeForest*, Aug. 1882 (CU). QUEENS: Richmond Hill, *Bicknell 8133* (NYS). RICHMOND: Garretsons, *Britton*, Jun. 1879 (ANS). SCHENECTADY: Schenectady, *Arnold*, ann. 1843 (CU). TIOGA: Apalachin, *Fenno 262* (NB, NYS). TOMPKINS: Groton to McLean, *Randolph 10819* (CU, G, NYS). ULSTER: Lake Minnewaska, *Sowden*, Jun.–Jy. 1922 (ANS). WASHINGTON: Shushan, *Dobbin 166* (NYS). WESTCHESTER: nr. Croton, *Pennell 7673* (ANS). NEW JERSEY: BERGEN: Westwood, *Pennell 9430* (ANS). BURLINGTON: Burlington (ANS). CAMDEN: Lindenwold, *Stone 6570* (ANS). CUMBERLAND: Vineland, *Gross*, Aug. 1869 (ANS). HUDSON: Hoboken (NB). HUNTERDON: Bloomsbury, *Bebler*, Jy. 1927 (UP). MORRIS: Chatham, *Mackenzie 245* (CCD). OCEAN: Highpoint, *Timmerman*, Jy. 1890 (NB; perhaps an error in locality). PASSAIC: Pompton Lakes, *Mackenzie 4218* (US). SOMERSET: Watchung, *Moldenke 1295* (ANS, Duke, Mo, NB, UP). SUSSEX: Cranberry Lake, *Mackenzie 2749* (Mo). WARREN: Oxford, *Wherry*, Jun. 1934 (UP). PENNSYLVANIA: ALLEGHENY: Glenshaw, *Bright*, Jun. 1911 (CM). ARMSTRONG: *S. W. Knipe* (CM). BEAVER: *Andriessen*, ann. 1880–90 (CM). BERKS: Hamburg, *Leibelsperger 366* (ANS). BLAIR: Altoona, *Mellor*, Jy. 1889 (CM). BUCKS: Neshaminy, *McDowell 309* (ANS). BUTLER: Saxonburg, *Shafer 65* (CM, CU, Pa, UP). CARBON: Lehighton (ANS). CENTER: Juniata Jct., *Wherry*, Jun. 1934 (UP). CHESTER: W. Chester, *Wm. Darlington*, Short herb.

(ANS). CRAWFORD: Hartstown, *Jennings*, Jun. 1922 (CM). DAUPHIN: Harrisburg, *Small*, Jun. 1888 (G). DELAWARE: Newtown Twp., *MacElwee 503* (ANS, G, Mo). FRANKLIN: Mercersburg, *T. Green*, May 1845 (ANS). LACKAWANNA: Dalton, *Twining*, Jy. 1907 (CM). LANCASTER: Reinholds, *Small*, Jun. 1890 (US). Lancaster, *Porter*, Jun. 1857 (G; type of var. *parviflora* Gray). LEHIGH: Allentown, *Pretz 6716* (ANS). LUZERNE: Beech Haven, *Heller*, Jun. 1889 (ANS, G). MERCER: Sharon, *Aschman*, Jy. 1886 (CM). MIFFLIN: Lewistown, *Jennings*, Jy. 1908 (CM, Pa). MONROE: Pocono Lake, *Harshberger*, Jy. 1904 (ANS, Mo). MONTGOMERY: Tylersport, *Long 24840* (ANS). NORTHAMPTON: Bethlehem, *Moser*, Jy. 1832 (US). PHILADELPHIA: Falls of Schuylkill, *Jeanes*, Jy. 1828 (ANS). SOMERSET: Stoyestown, *Patterson*, Jun. 1880 (CM). VENANGO: East Sandy, *Garber*, Aug. 1869 (ANS). WASHINGTON: Charleroi, *Jennings*, Jun. 1904 (CM). WESTMORELAND: Ligonier to Donegal, *Jennings*, Jun. 1904 (CM). DELAWARE: NEWCASTLE: Stanton, *Randolph 101* (CU, G). SUSSEX: Frankford, *Commons*, Jun. 1875 (ANS). MARYLAND: GARRETT: Oakland, *Shreve 551* (US). HARFORD: Flintville, *Adams et al. 929* (ANS). VIRGINIA: BEDFORD: *Curtiss*, Jy. 1871 (G). CAMPBELL: Lawyers Road, *Heller*, Jy. 1893 (ANS). WEST VIRGINIA: GREENBRIER: Cranberry Summit, *G. Guttenberg* (CM). POCAHONTAS: Rimel, *Core 3488* (WVa). NORTH CAROLINA: BUNCOMBE: Biltmore, *Biltmore herb. 626* (CU, M, US); Asheville, *Kraus*, Jun. 1925 (W). HAYWOOD: True Love Mt., *Blomquist 5031* (Duke). JACKSON: Cullowhee, *Thaxter*, ann. 1887 (G). SWAIN; Great Smoky Mts., *Beardslee and Kofoid*, Aug. 1891 (Mo; near var. *leptostachys*). GEORGIA: FLOYD: Rome, *Ravenel* (Mo). ALABAMA: TALLADEGA: Riddell's Mill, *Mohr* (US; near var. *leptostachys*). TENNESSEE: KNOX: Dead Horse Lake, *Sharp*, Jun. 1930 (G). OHIO: CLARK: Springfield, *Williams* (Mo). CUYAHOGA: Berea, *Ashcroft*, Jy. 1897 (NB). ERIE: Castalia, *Jennings*, Aug. 1911 (CM). FAIRFIELD: Sugar Grove, *Werner 98* (G). FRANKLIN: Columbus, *W.S.S.*, Torrey herb., ann. 1840 (NB). MAHONING: Perkins, *Moseley*, Jy. 1894 (Mo). SUMMIT: Akron, *Ashcroft*, Jy. 1896 (Mo). WOOD: Bowling Green, *Moseley*, Jy. 1919 (Mo). INDIANA: LAGRANGE: Mongo, *Deam 39084* (ANS). LAKE: Pine, *Deam 43306* (CCD). NOBLE: Kendallville, *Deam 36624* (ANS). PORTER: Crisman, *Deam 31564* (part) (CCD). STEUBEN: Lake Gage, *Deam*, Jun. 1903 (CCD, G, Mo, NB, US, W). WARREN: Rainsville, *Deam 25874* (CCD). ILLINOIS: CHAMPAIGN: Rantoul, *Gleason*, Jy. 1907 (G). DUPAGE: Naperville, *Wellner*, Jun. 1896 (W). JO DAVIESS: Portage, *Lansing 4091* (ANS). LAKE: Beach, *Umbach 3712* (W). LASALLE: Ottawa, *Huett* (G). MC LEAN: Bloomington, *Robinson*, Aug. 1886 (G). MICHIGAN: BAY: Bay City, *Dreisbach 5958* (ANS). CHEBOYGAN: Indian River, *Ehlers 2968* (W). CHIPPEWA: Sault Ste. Marie, *McMullen* (G). CRAWFORD: Grayling, *Mell 214* (US); *Piper*, Jy. 1922 (US; G, in part). INGHAM: Haslett, *Yuncker 415* (US). IONIA; Hubbardston, *E. F. Smith*, ann. 1877 (G). MASON: Ludington,

Chaney 12 (US). MENOMINEE: Menominee, *Schuette*, Jun. 1891 (US, W). MIDLAND: Midland, *Dreisbach 102* (ANS). ST CLAIR: Port Huron, *Glatfelter*, Jy. 1888 (Mo). WASHTENAW: Whitmore Lake, *Ehlers 1488* (G). WAYNE: Detroit, *Lugger*, Jy. 1891 (M). WISCONSIN: ADAMS: Friendship, *Rhoades*, Jy. 1927 (CU). BROWN: DePere, *Kellogg*, Jy. 1888 (US). BUFFALO: nr. Fountain City, *Finkelnburg* (CM). CRAWFORD: Prairie du Chien, *H. H. Smith 7636* (W). DANE: Madison, *Sprague 1200* (W). DUNN: Menomonie, *Bachman*, Jy. 1928 (W). EAU CLAIRE: Fall Creek, *Kunz 220* (W). IOWA: Dodgeville, *Breakey*, Jun. 1929 (W). JACKSON: Black River Falls, *H. H. Smith 6795* (W). JUNEAU: Camp Douglas, *Mearns 529* (NB). LAFAYETTE: Fayette, *Cheney*, Jy. 1888 (W). MARATHON: Mosinee, *Cheney 3270* (W). MARINETTE: Athelstane, *Davis*, Jy. 1915 (W). MILWAUKEE: Milwaukee, *Hasse* (NB). WALWORTH: E. Troy, *Almon*, Aug. 1926 (W). WAUPACA: Readfield, *A. Smith 110* (W). WAUSHARA: Richford, *Taylor*, Jy. 1932 (W). MINNESOTA: CASS: Bridgeman, *Sheldon 3289* (part) (M). MILLE LACS: Princeton, *Sheldon 3116* (M). OLMSTED: Rochester, *Ainslee*, Jy. 4, 1902 (M). SCOTT: Savage, *Rosendahl*, Sep. 1924 (part) (M). WABASHA: Lake City, *Manning*, Jy. 1892 (M). WASECA: Janesville, *Taylor 550* (M). MISSOURI: BUTLER: Poplar Bluff, *Eby*, Jy. 1893 (Mo). IRON: Pilot Knob, *Glatfelter*, Aug. 1895 (Mo). ST. LOUIS: *Engelmann*, May 1836 (ANS); *Eggert*, Jun. 1879 (Mo). ARKANSAS: WASHINGTON: Fayetteville, *Watts*, Jun. 1925 (W); this plant is perhaps related to *L. appendiculata*. NORTH DAKOTA: KIDDER: Dawson, *Metcalf 274* (CU).

c) Var. HIRTELLA Gray, Syn. Fl. 6. 1878. TYPE LOCALITY: "chiefly towards and beyond the Mississippi." TYPE SPECIMEN: authentic material seen in the Gray Herbarium.—*L. hirtella* Greene, Pittonia III: 349. Sep. 27, 1898.—Differs from the var. *originalis* in being bristly-pubescent nearly throughout; the lower stem is bristly, especially on the angles. Flower-bracts densely bristly, especially near the margins; the lower usually lanceolate, leafy, to 2.5 cm. long, often exceeding the flowers. Calyx densely bristly, especially on the conspicuous ribs. Calyx-lobes usually narrowly lance-linear (sometimes deltoid), 3.5–7.0 mm. long, bristly; often with a conspicuous raised midrib. Calyx in fruit hemispheric or varying to ovoid, 3.5–6.0 mm. long and 3.0–3.5 mm. across; capsule ½–¾ inferior. Auricles of the calyx-lobes often conspicuous. Plants as a rule smaller than var. *leptostachys* or var. *originalis;* mostly 15–60 cm. high. Inflorescence usually 30–60 flowered. Leaves in many cases clustered on the lower half of the stem.—Low open meadows and prairies; sometimes in dry soil, north-western Indiana to eastern Kansas, northwest to western Nebraska, South Dakota, northern Minnesota, Saskatchewan (north to the 52d parallel), and Alberta. In nearly or quite typical form passing eastward through Michigan, northern New York and New England to the Gaspé Peninsula; apparently common on Long Island. Flower June 1–August 1; somewhat earlier in the southern part of its

range than in the northern. Representative Material seen: Quebec: gaspé: mouth of Grand River, *Pease 5255* (G). hull: Chelsea, *Harrington*, Jy. 1908 (O). Ontario: bruce: Big (=Dorcas) Bay, *Krotkoff 7835* (G). durham: Hampton, *Allin*, Jy. 1927 (Toronto). essex: Leamington, *Macoun*, herb. G. S. Can. 54135 (O). hastings: Belleville, *Macoun 1115* (G); *Macoun 48* (Toronto). muskoka: Port Sydney, *Ivey*, Jy. 31, 1906 (Toronto). Timagami Forest Reserve: *Watson 1923* (Toronto). Maine: androscoggin: E. Auburn, *Merrill 589* (NE). cumberland: Brunswick, *Furbish*, ann. 1899 (NE). franklin: Chesterville, *Chamberlain*, Jy. 1902 (NE). hancock: Swan Island, *Hill 2247* (NE). oxford: Newry, *Williams*, Jy. 1906

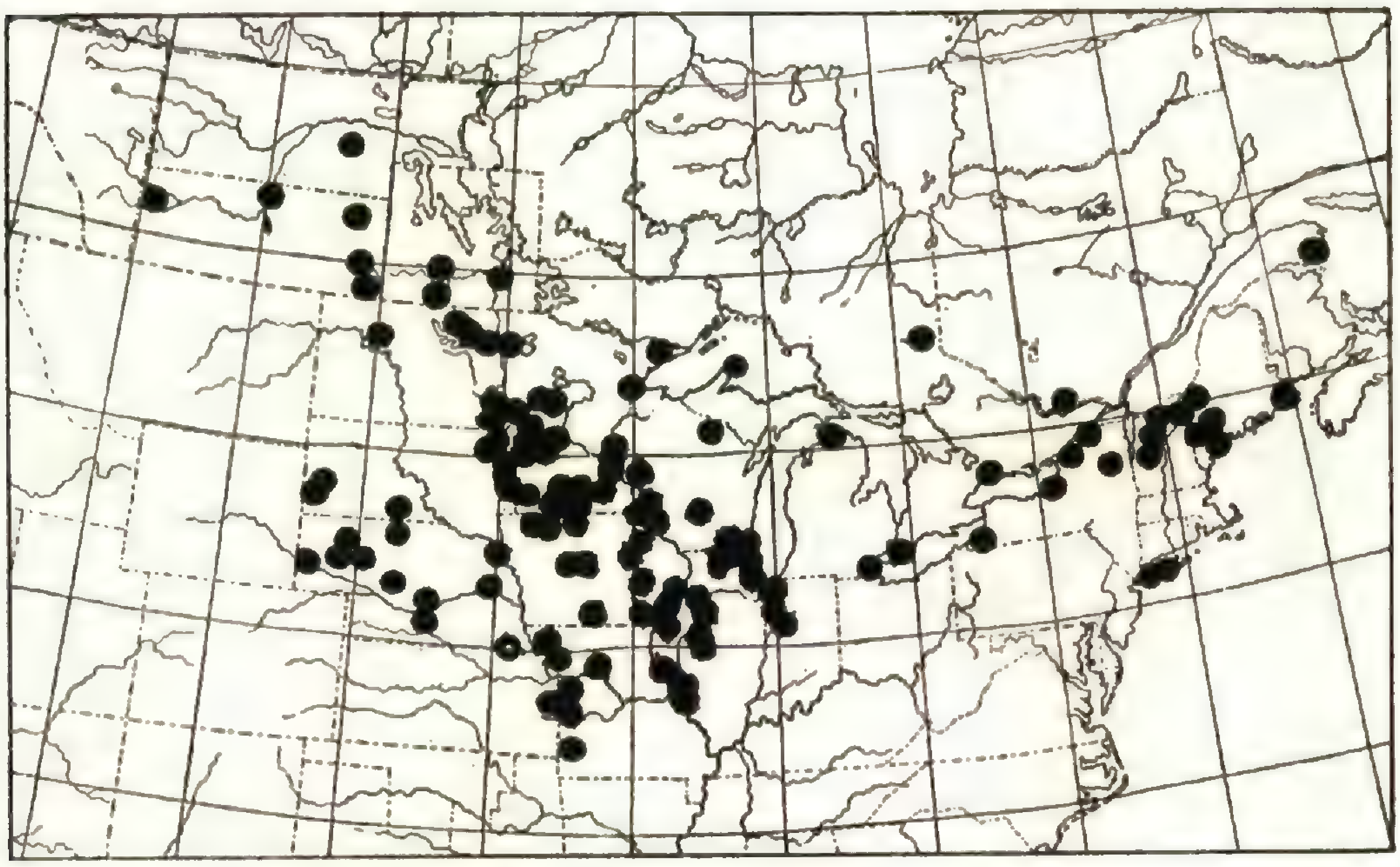

Fig. 16. Range of Lobelia spicata, var. hirtella.

(G). piscataquis: Milo, *Fernald*, Sep. 1900 (NE). somerset: Dead River, *Fernald*, Aug. 1896 (NE). washington: Carlow Island, *Fernald 2133* (G, NE). york: N. Berwick, *Parlin*, Jy. 1893 (part) (G). New Hampshire: coös: Randolph, *Pease 18076* (NE). Vermont: caledonia: Peacham, *Blanchard*, Jy. 1892 (Mo). orleans: Willoughby, *Winslow*, Jy. 1904 (NE). rutland: Brandon, *Dutton*, Jy. 1909 (Mo). New York: chautauqua: Nashville, *Perkins*, Jy. 1927 (CU). Essex: Newcomb, *House 9078* (G, NYS). nassau: Hempstead, *Gershoy 995* (CU). st. lawrence: Lisbon, *Phelps 914* (G, NB). suffolk: Babylon, *Clute 157* (CM). Indiana: clark: Clarke, *Umbach 3867* (W). lake: Gary, *McCoy*, Jun. 1933 (Duke). newton: Morocco, *Deam 31675* (CCD). porter: Dune Park, *Umbach 1074* (W). pulaski: San Pierre, *Deam 43239* (CCD). white: Idaville, *Deam 48852* (CCD). Illinois: cook: Chicago, *Moffatt 1883* (W). dupage: Naperville, *Umbach 5532* (W). hancock:

Augusta, *S. B. Mead,* Jun. 1859 (ANS). HENDERSON: Oquawka, *Patterson* (ANS, US). LAKE: Beach, *Johnson 1821* (NB). MC HENRY: Ringwood, *Vasey* ann. 1862 (G). MASON: Kilbourne, *Gleason,* Aug. 1903 (G). MENARD: Athens, *Hall,* ann. 1861 (G, Mo). OGLE: Holcomb, *Beck,* Jy. 1907 (W). PEORIA: Peoria, *McDonald,* Jun. 1903 (NB); Jun. 1904 (G). ROCK ISLAND: Joslin, *Harper,* Jy. 1886 (W). STARK: Wady Petra, *Chase 592* (ANS, Mo). WILL: Romeo, *Powell,* Jun. 1898 (W). WINNEBAGO: prairies, *Bebb,* Jy. 1858 (G). MICHIGAN: CHEBOYGAN: Burt Lake, *Ehlers 4634* (CU). KEWEENAW: Keweenaw Point, *Wood 1642* (NC, US); sterile hills, *Farwell,* ann. 1889 (G; fid. A. Gray). MONROE: Raisinville, *Atkinson,* Jun. 1883 (CU, US). WISCONSIN: BUFFALO: nr. Fountain City, *Finkelnburg* (M). DANE: Primrose, *Fassett 3459* (G, NB, W). LACROSSE: LaCrosse, *Trelease* (probably), Jy. 1887 (Mo). RACINE: Racine, *Davis,* Jun. 1881 (W). ROCK: Janesville, *Skavlem,* Jun. 1889 (W). SAUK: Baraboo, *True* (W). VERNON: Viroqua, *H. H. Smith 7218* (W). WALWORTH: Delavan, *Hollister 25* (US). WINNEBAGO: Winnebago, *James,* Jy. 1894 (W). MINNESOTA: BLUE EARTH: *Leiberg,* ann. 1883 (M). BROWN: Springfield, *Sheldon,* Jy. 1891 (M). CHIPPEWA: Montevideo, *Moyer,* Jy. 1891 (M). CHISAGO: *Sandberg,* Jun. 1886 (M). CLAY: Glyndon, *Solheim 165* (R). DOUGLAS: Lake Christina, *Sheldon 3466* (M). HENNEPIN: meadows, *Sandberg,* Jy. 1890 (M, W). HOUSTON: Spring Grove, *Rosendahl 477* (M); *501* (G). JACKSON: Heron Lake, *Skinner,* ann. 1902 (M). KANDIYOHI: Spicer, *Frost,* Jy. 1892 (G, M, W). LAKE: Echo Lake, *Barber 12* (G). NICOLLET: Nicollet, *Ballard,* Jy. 1892 (M, R, US). OLMSTED: Rochester, *Ainslee,* Jun. 19, 1902 (part) (M). OTTER TAIL: Fergus Falls, *Sheldon 3699* (M). PIPESTONE: Pipestone, *Sheldon 1475* (M). POLK: Crookston, *MacMillan and Skinner 57, 297* (M). POPE: Glenwood, *Taylor,* Jy. 1891 (M). RAMSEY: New Brighton, *Moyer,* Jun. 1897 (M). ST. LOUIS: Duluth, *Johnson 1263* (part) (NB). SCOTT: Savage, *Rosendahl,* Sep. 1924 (part) (M). STEARNS: Pleasant Lake, *Campbell C165* (M). WATONWAN: St. James, *Fowler 25037* (W). WINONA: Winona, *Holzinger,* Aug. 1890 (US). IOWA: BENTON: Vinton, *Davis* (W). BLACK HAWK: low prairie, *Burk 388* (Mo). DECATUR: *J. P. Anderson,* Jun. 1902 (Mo, R). EMMET: Armstrong, *Cratty,* Aug. 1898 (US). FAYETTE: Fayette, *Parker* (M). GREENE: Grand Junction, *Wiegand et al. 2401* (CU). JOHNSON: Iowa City, *Somes 3202, 3204* (US). KOSSUTH: Wesley, *Breithaupt,* Jun. 1898 (W). STORY: Ames, *Ball and Combs 500* (G, Mo, R, US). VAN BUREN: Bentonsport, *Graves 1894* (Mo). MISSOURI: CHARITON: *Young,* Jun. 1925 (CM). JEFFERSON: "Crystall City," *Eggert,*Aug. 1886 (CM). MARION: Hannibal, *Davis 1190* (Mo). NODAWAY: Marysville, *Palmer 25434* (Mo). NORTH DAKOTA: "upper James River," (no state given), *Geyer,* Nicollet's N. W. Exp., Jy. 13, 1839 (US). BENSON: Leeds, *Lunell,* Jy. 6, 1901 (ANS, M, R, W). CASS: Buffalo, *Westergaard,* Aug. 1897 (R). GRAND FORKS: Grand Forks, *Brannon 240* (Mo). NELSON: Tolna, Jy. 25, 1911 (R). RICH-

land: Fairmount, *Bergman* 2326 (ANS, M, Mo). ward: Minot, *Lakela 489* (M). South Dakota: brookings: Brookings, *Williams*, Jy. 21, 1893 (ANS, M, Mo). custer: Custer, *Rydberg, 850* (US). day: Waubay, *Moore 55* (M). deuel: Toronto, *Moore 885* (M). meade: Piedmont, *Pratt*, Jun. 1895 (M). moody: Flandreau, *Griffiths*, Aug. 1892 (Mo, US). roberts: White Rock, *Powell*, ann. 1903 (G). tripp: Keya Paha River, *E. J. Wallace* (NB). Nebraska: brown: Long Pine, *Bates*, Jy. 1895 (M). buffalo: Kearney, *E. R. Holmes*, Jun. 1887 (NB); "Ft. Kearney on the Platte," *H. Engelmann*, Jun. 1858 (Mo.). cedar: Aten, *Clements 2656* (CU, Del, G, M, US). cherry: sand-hills, *Smith and Pound 37* (Mo). custer: Callaway, *Bates 2358* (G). grant: Whitman, *Rydberg 1818* (G, US). kearney: Minden, *Hapeman*, Jy. 1897 (W). platte: Columbus, *Pennell 16014* (ANS). scotts bluff: Platte Bottom, *Rydberg 222* (US). thomas: Halsey, *Krautter*, Jy. 1907 (UP). Kansas: leavenworth: "Ft. Kearney to Ft. Leavenworth," *Fendler 79* (G). miami: Paola, *Oyster*, Jy. 1883 (US). Manitoba: "N. W. Territory," *Nicollet 414* (ANS) (not surely from Man.). brandon: Brandon, *Macoun*, herb, G. S. Can. 14146 (O, US). souris: Turtle Mt., *T.J.W.B. 139*, Jy. 1874 (Toronto). winnipeg: Winnipeg, *Scott*, Jy. 1904 (Toronto). Saskatchewan: "20 m. W. Yorkton, along Grand Trunk Pacific R. R.," *Macoun*, herb. G. S. Can. 78479 (CM, CU, G, O); Moose Mt., *Macoun*, Jy. 1883 (Del); "near the South Saskatchewan," *Macoun*, herb. G. S. Can. 15253 (O). assiniboia: Souris Plain, *Macoun*, herb. G. S. Can. 15254 (O). humboldt: Wadena, *McGugan* (Toronto); Touchwood Hills, *Macoun and Herriot*, herb. G. S. Can. 78480 (O). Alberta: craigmyle: prairie, "SE 28-32-16 W 4," *Brinkman*, Jy. 1923 (US).

Note: While the above are all referred to the var. *hirtella*, it should be observed that the variety reaches its most characteristic form only in the region west of the Mississippi, and occasionally eastward. From Wisconsin eastward, most plants seen lack the short stature of the prairie plant, and are placed in var. *hirtella* because of the combination of general bristly pubescence, combined with leafy flower-bracts.

d) Var. **campanulata**, var. nov.; caule paucifloro, calycis tubo oblongo vel hemisphaerico, antheris albis, capsulis subinflatis. Type Locality: Kinderhook, Columbia Co., N. Y. Type Specimen: *McVaugh 2673A;* deposited at the University of Pennsylvania; duplicates at Cornell University and the New York State Museum. Vegetatively not to be distinguished from the var. *originalis*. Inflorescence a loose terminal raceme, hardly more than a third the height of the plant, not noticeably secund, bearing 10–35 (50) (ave. 20–25) widely spaced flowers upon short (in fruit 4–5 mm.), rather stout, rough-puberulent pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts smooth, linear, somewhat longer than the pedicel (5–9 mm. long), callose-denticulate. Calyx in bud

Type of Lobelia spicata Lam.

and in anthesis short-campanulate, smooth or slightly puberulent, becoming sub-globose in fruit, strongly ribbed, 3.5–5.0 mm. across by 4.5–6.0 mm. high. Capsule ⅔ inferior or more. Calyx-lobes short-lanceolate, flat, 3–4 mm. long, smooth, entire; auricles lacking. Flower 7–9 mm. long, including the campanulate calyx. Corolla distinctly dark-purplish, smooth, except for the slightly pubescent base of the lower lip. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate-oblong, slightly shorter than the

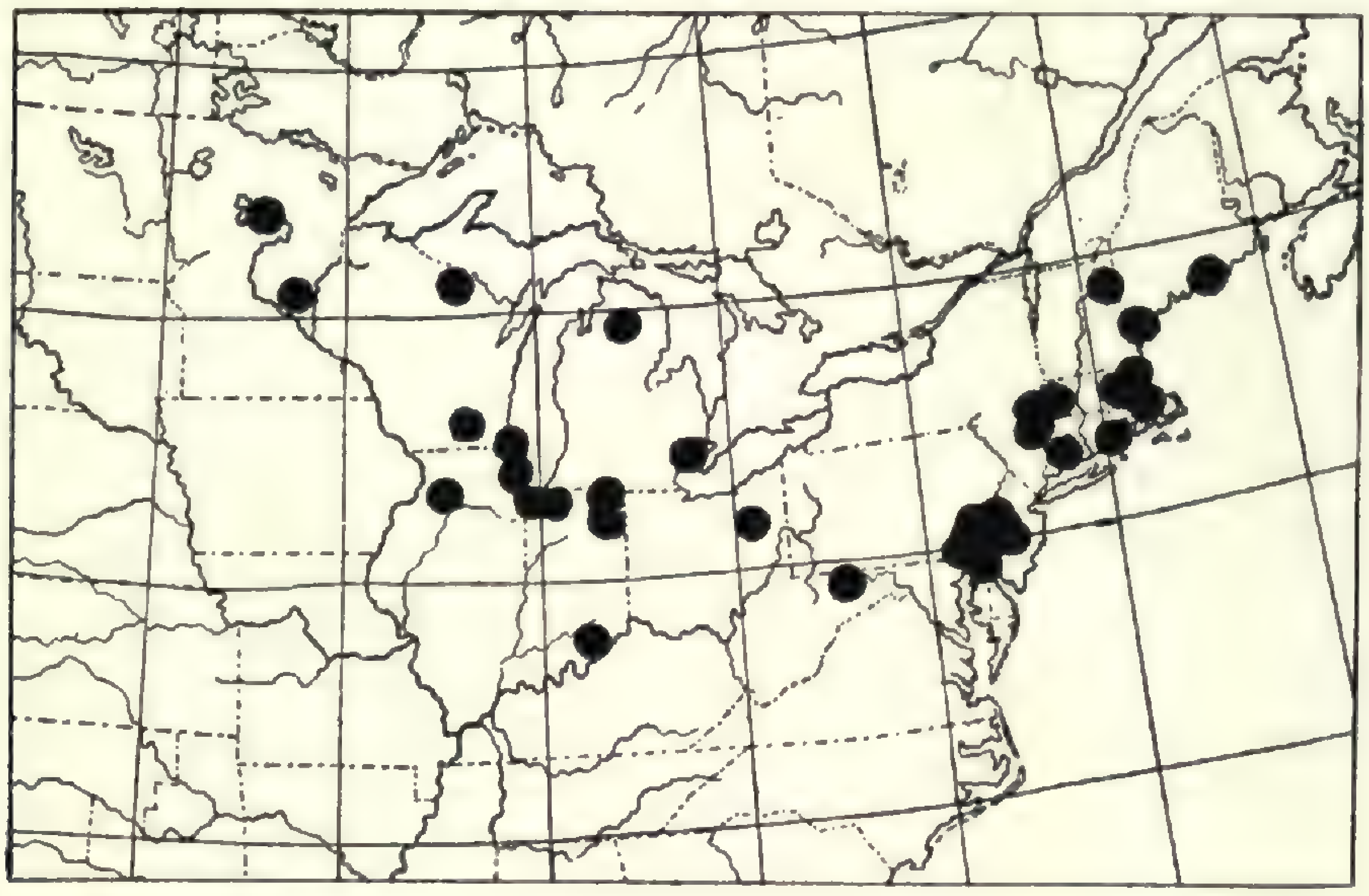

FIG. 17. Range of LOBELIA SPICATA, var. CAMPANULATA.

tube, not sharply reflexed; two upper lobes lanceolate. Filament-tube 2.0–2.5 (3.0) mm. long, slightly pubescent below, connate about half its length above. Anther-tube 1.0–1.5 mm. long, white, the two smaller anthers tufted, the three larger smooth or pubescent on the backs. Style exserted, recurved. Seeds apparently somewhat larger than in var. *originalis*.

This plant differs from var. *originalis* by the campanulate calyx, the globose, larger capsules, white anthers, smaller flowers in every way, fewer flowers, earlier flowering period (7–10 days in eastern New York). It probably does not deserve specific rank, as plants with white anthers and small flowers are sometimes found in the other varieties of *L. spicata*. This phenomenon may be one of arrested development or some other abnormality, as similar conditions are seen occasionally in other parts of the genus (e.g. *L. puberula*). However, when the earlier flowering period is considered, as well as the definite changes in calyx, capsule and inflorescence, it seems desirable to separate this plant from var. *originalis*.

Everywhere with var. *originalis*, but apparently rare except on the Eastern Seaboard from southern Maine to Pennsylvania; from Pennsylvania to Virginia it intergrades freely with the var. *scaposa*.

Flowers a few days earlier than var. *originalis;* from June 1. Material seen: Maine: hancock: Mt. Desert, fields nr. Long Pond, *Redfield*, Jy. 1892 (part) (NE). york: N. Berwick, *Parlin*, Jy. 1892 (1 sheet) (G). New Hampshire: coös: Dalton, *Pease 12150* (part) (NE). Vermont: Addison: Ferrisburgh, *Horsford*, ann. 1882 (part) (G). Massachusetts: berkshire: Tyringham, *Vail*, Jun. 1897 (NB). bristol: Swansea, *Sanford 10336* (part) (NE); Dartmouth, *Fernald 1068* (part) (NE). essex: Montserrat, *Hubbard*, Jy. 1913 (NE); S. Georgetown, *Williams*, Aug. 1899 (NE). middlesex: Concord, *Deane*, Jy. 1886 (NE). S. Acton, *Deane*, Jy. 1886 (part) (US); Chelmsford, *Eames*, Sep. 1914 (CU). norfolk: Needham, *Fuller*, Jy. 1883 (part) (NE); Norfolk, *Ware 2485* (part) (NE). Connecticut: *Chas. Wright* (part) (CM). hartford: Southington, *Bissell*, Jy. 1897 (part) (Mo). new london: Franklin, *Woodward*, Jy. 11, 1906 (G, NE). New York: columbia: Kinderhook, *McVaugh 2673A* (CU, NYS, UP). dutchess: Madalin, *McVaugh 2674A* (UP). st. lawrence: Lisbon, *Phelps 914* (CU). New Jersey: burlington: Mt. Holly, *Meredith*, Jun. 1922 (ANS). Pennsylvania: berks: Lobachsville, *Long 12632* (ANS). bucks: Upper Black Eddy, *True*, Jy. 1925 (part) (UP). chester: Paoli, *Pennell 3905* (part) (UP); West Chester, *Pennell 1224* (ANS). delaware: Haverford, *Burk* (part) (UP); Lenni, *Redfield 4516* (Mo); Wawa, *Pennell 21* (part) (ANS); Williamson, *Pennell 194* (part) (ANS). lancaster: Lancaster, *Stevens*, Jy. 1874 (part) (Mo). montgomery: Penllyn, *MacElwee*, Jun. 1903 (1 plant, ANS). northampton: Easton, *Porter*, Jun. 1896 (ANS). Delaware: newcastle: Centreville, *Commons*, Jun. 1866 (part) (ANS). Maryland: garrett: dry open woods, *J. D. Smith*, Jy. 24, 1883 (US). Ohio: stark: Canton, *Steele 14* (US). Indiana: clark: *Deam 6897* (part) (CCD). lagrange: Mongo, *Deam 20706* (CCD). lake: Hammond, *Deam 1456* (part) (CCD). noble: Eagle Lake, *Deam 31252* (part) (CCD). porter: Crisman, *Deam 31564* (part) (CCD). Illinois: *Vasey*, herb. Olney (G). cook: Chicago, *Babcock*, Jun. 1874 (part) (US). lake: Waukegan, *Umbach 5840* (W). whiteside: Fulton, *Harper*, Jun. 1892 (W). Michigan: crawford: Grayling, *Piper*, Jy. 1922 (part) (G). wayne: Detroit, grassy fields, *Farwell*, Jun. 1900 (part) (G). Wisconsin: dane: Madison, *Trelease*, Jun. 1889 (part) (Mo). Minnesota: anoka: Centreville, *Sandberg*, Jy. 30, 1891 (part) (Del); "Northern A. Co.," *Butters and Rosendahl 5056* (M). cass: Bridgeman, *Sheldon 3289* (part) (M); this also shows its affinity to var. *hirtella*. olmsted: Rochester, *Ainslee*, Jun. 1902 (part) (M). Iowa: decatur: *Fitzpatrick*, May 1896 (part) (Mo).

e) Var. **scaposa**, var. nov., foliis radicalibus ovatis obtusis petiolatis, caulinis raris parvis, racemo elongato laxo, calycis appendicibus non longis. Type Locality: "Danville to Fall Creek" (Pittsylvania Co., Va.). Type Specimen: *Small and Heller 108*, Jun. 3, 1891, in the University of Penna.—Possibly *L. pallida* Muhlenberg, Cat. Pl. Am. Sep. 22. 1813. Probably *L. pallida* Elliott, Sk. Bot. S. C. & Ga.

I: 265. 1821 (in part). Probably *L. paniculata* Rafinesque, N. Fl. N. Am. II: 18. 1836. *L. spicata* Hitchcock and Standley, Fl. Dist. Col. 263. 1919.—Stem strict, unbranched, 40–110 cm. high (ave. about 65 cm.), green, or with a slight reddish tinge near the base; smooth, or pubescent, especially on the angles, below. Cauline leaves inconspicuous, thin, 1–6, usually only about 3 in number, all below the middle of the stem, all acute, bract-like, 1–2 cm. long, lanceolate, sharp-denticulate, or the lowest one oblanceolate or oblong, obtuse, about 1.5 × 5.0 cm. (in extreme cases 2.5 × 9.0 cm.). Basal leaves 1–12, conspicuous, obovate, ovate or round, narrowed into margined petioles, 1.5–5.5 × 3–10 cm. (ave. about 3.5 × 5). All leaves more or less strigose-pubescent, especially near the margins and near the base of the plant. Inflorescence a loose terminal raceme, 10–60 cm. long (ave. about 30 cm.), usually about half the height of the plant, appearing naked, because of the disproportionately large basal leaves; somewhat interrupted, sometimes sub-secund, bearing 10–90 (ave. about 40) widely spaced flowers upon short (in flower 4–6 mm.) slender pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts smooth, lance-linear or sometimes narrowly lanceolate, about equalling the pedicels, 4–10 mm. long. Calyx in anthesis broad-conic, smooth, becoming hemispheric to sub-globose in fruit, about 4 mm. in diameter. Capsule (where seen) ⅔ inferior. Calyx-lobes lanceolate to linear, 2–6 mm. long, smooth, entire; auricles usually conspicuous at the base of each lobe, triangular or short-filiform. Flower 7.0–10.5 mm. long, including calyx (ave. 9.0 mm.). Corolla pure white to light blue, the lower lip pubescent at base inside, otherwise smooth. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate, shorter than the tube, sometimes sharply reflexed in dried material; the two upper lobes lanceolate, recurved or erect. Filament-tube 3.0–3.5 mm. long, pubescent below, connate about half its length above, often deflexed, so that the anther-tube and the upper part of the filament-tube are not contained in the corolla, but project above it, through the dorsal fissure. Anther-tube 1.7–2.0 mm. long, light bluish-gray, the two smaller anthers tufted at the tip, the three larger smooth or pubescent on the backs.

Differs from var. *originalis* by the larger basal leaves, fewer stem-leaves, the naked inflorescence, which is longer in proportion, the more conspicuous auricles, slightly smaller flowers, broader calyx, earlier flowering period. Is sometimes confused with var. *leptostachys* because of the auricles, which may be conspicuous, but the almost naked stem should prevent such a mistake.—Low open woods and hillsides, in moist or dry situations, southern Pennsylvania to central North Carolina, central Mississippi, and Louisiana. Apparently mostly confined to the Piedmont. Flower May 20–June 20. Material seen: PENNSYLVANIA: *Rev. J.H.B.* (Porter herb.), Jun. 10, 1845 (ANS). FRANKLIN: Mercersburg, *Detwiller herb.*, Jun. 2, 1845

(ANS); Mt. Alto, *Illick*, ann. 1909 (Mo). FULTON: Big Cove Tannery, *Gress*, Aug. 1921 (Pa). YORK: Loganville, *Glatfelter*, Jun. 1895 (Mo); York Furnace, *Stone 2919* (ANS). MARYLAND: ALLEGANY: Cumberland, *J. D. Smith*, Jy. 1883 (US); Cumberland, *Shriver*, Jy. 1894 (NB). BALTIMORE: *J. D. Smith*, Jun. 8, 1880 (US); "nr. Baltimore," *D. Foreman*, ann. 187– (US); Woodbrook, *Waters*, Jun. 1892 (US). CECIL: Elkton, *Long 34066* (ANS). MONTGOMERY: Glen Echo, *Pollard 292* (US); Chevy Chase, *Wherry*, May 1934 (UP); Rockville, *Painter 1344* (Mo); Kensington, *House 1000* (Mo); "nr. D. C. line at Mass. Avenue," *Bowen #6* (UP). WASHINGTON: Harpers Ferry,

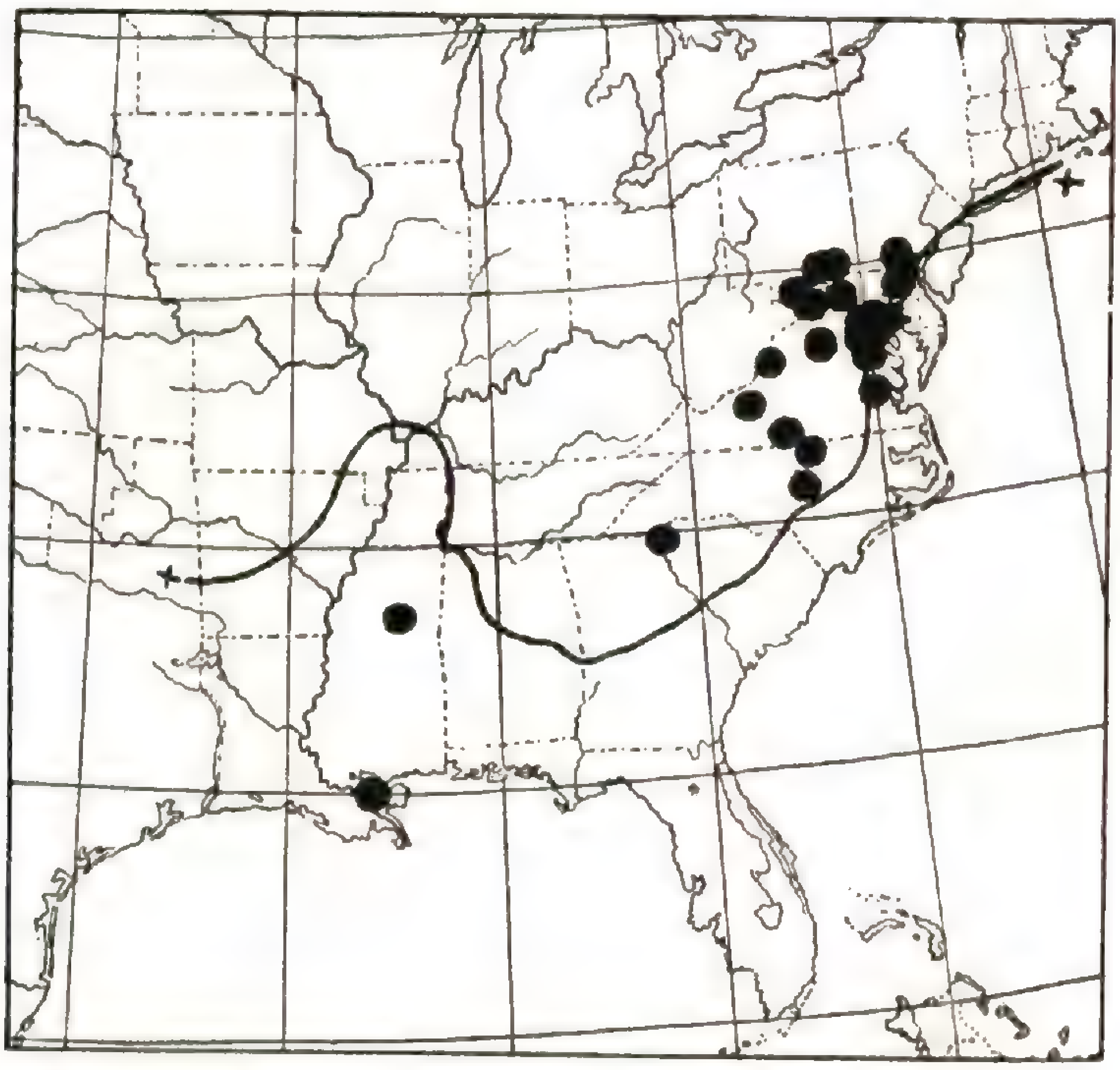

FIG. 18. Range of LOBELIA SPICATA, var. SCAPOSA.

Topping, May 1897 (US). DISTRICT OF COLUMBIA: Washington, *W. A. Henry*, Jun. 1879 (W); Rock Creek, *Comstock*, May 1881 (CU); "nr. Washington," *Blanchard*, May 1891 (NB); Washington, *Kearney*, Jun. 1897 (NB). VIRGINIA: "oak forests," *Tidestrom 6366* (US). ARLINGTON: Ft. Myer, *Mearns*, Jun. 1895 (G, NB). BATH: Millboro, *Wherry*, Jun. 1934 (UP). CHESTERFIELD: Winterpock, *Wherry*, May 1934 (UP). FAIRFAX: Chain Bridge, *Sheldon*, Jun. 1881 (NYS); Great Falls, *Moore 4521* (G); Occoquan, *Randolph 157* (CU, G). MONTGOMERY: Blacksburg, *Murrill*, Jun. 1895 (NB); PAGE: Luray, *A. Brown et al.*, Jun. 1890 (ANS, NB). PITTSYLVANIA: Danville to Fall Creek, *Small and Heller 108*, Jun. 3, 1891 (ANS, M, NB, UP). PRINCE WILLIAM: Buckland, *Meredith*, May 1922 (ANS); Gainesville, *Pennell 13326* (ANS). SPOTSYLVANIA: Fredericksburg, *Wright, et al.*, May 1917 (CU). STAFFORD: Falmouth, *Wiegand and Manning 3092*

(CU, G). West Virginia: hampshire: Hanging Rock, *Frye*, Jun. 7, 1933 (WVa); Hanging Rock, *Koenig*, Aug. 1887 (WVa); Hietts Run, *W.V.U. Bot. Exp.*, Jy. 2, 1926 (WVa). North Carolina: chatham: 12 m. S. Chapel Hill, *Totten*, Jun. 1931 (NC). orange: Chapel Hill, *Totten*, Jun. 1915 (NC). person: *Blomquist 5030* (Duke). South Carolina: oconee: Newry, *House 3477* (NB). Mississippi: choctaw: Ackerman, *Jensen*, Jun. 1905 (Mo). Louisiana: orleans: "nr. New Orleans, *Dr. Ingalls*," Torrey herb. (NB).

The following list is made up of specimens which seem not to belong

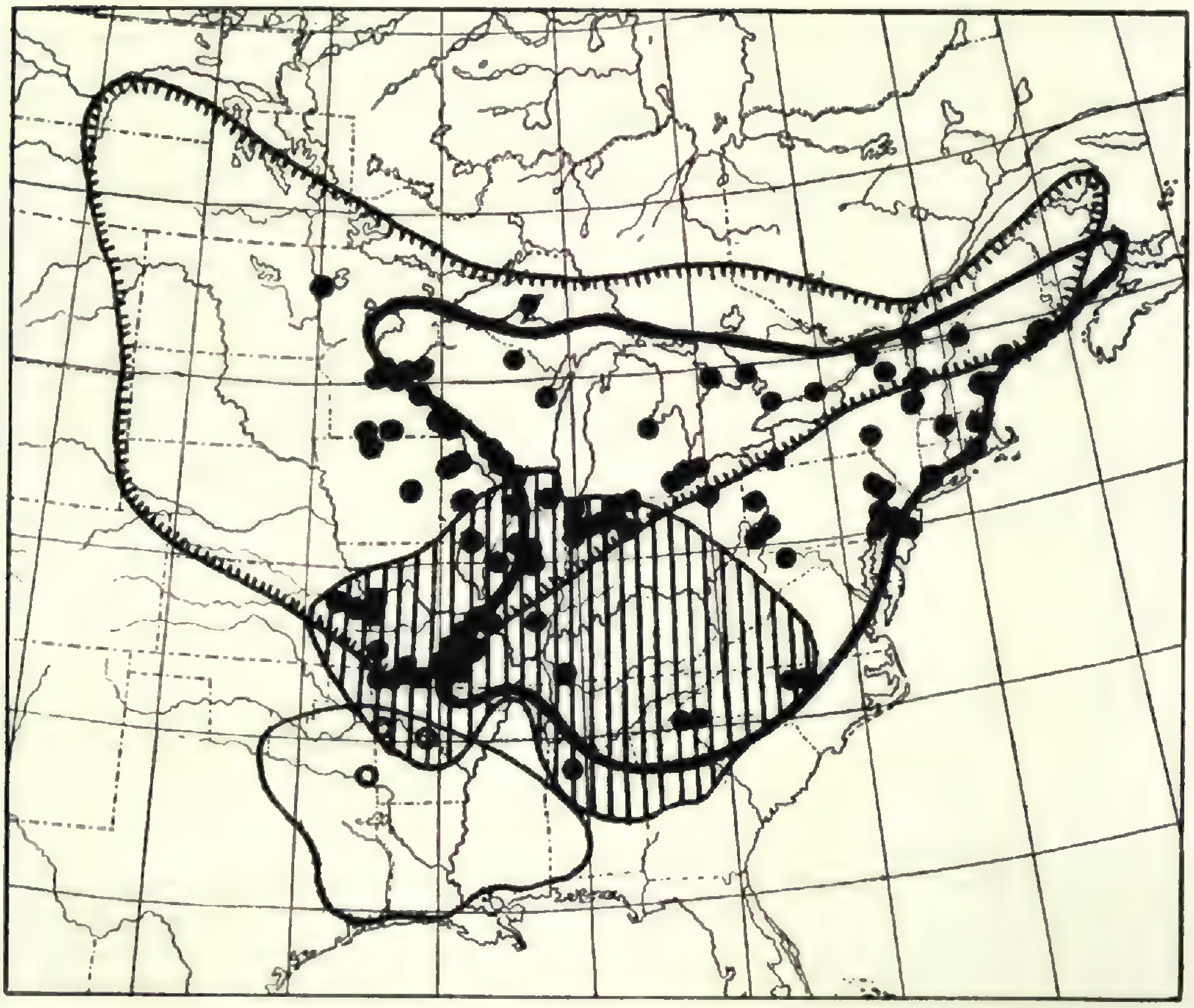

Fig. 19. Ranges of Varieties of Lobelia spicata: Var. leptostachys (vertical lines); var. originalis (oblique lines, left to right); var. hirtella (oblique, right to left). Range of L. appendiculata (plain). Dots represent plants not surely referred to any of the named forms; that is, intermediates. Records from the Atlantic states and southern New England are merely of occasional hairy individuals of the smooth var. originalis.

to any of the named varieties of *L. spicata*, but to possess features peculiar to two or more of the varieties; that is, they seem to be intermediates of various sorts. The initials in parenthesis after each citation indicate the varieties which the specimen seems to resemble most closely. The letters "app" stand for *L. appendiculata*. Virginia: stafford: Falmouth, *Wiegand and Manning 3093* (CU)

(sc-ca). KENTUCKY: CHRISTIAN: "barrens," *C. W. Short* (ANS) (lep-or). INDIANA: ALLEN: Ft. Wayne, *Deam 1337* (CCD) (lep-or). FULTON: DeLong, *Deam 39265* (CCD) (lep-or). KOSCIUSKO: Leesburg, *Deam 5118* (NB) (lep-or). ILLINOIS: DUPAGE: Lisle, *Martinek*, Jy. 1919 (US) (lep-or). MACON: 6 m. W. Decatur, *Clokey*, Jy. 1915 (NYS) (lep-hir). PEORIA: Peoria, *McDonald*, Jy. 1890 (G) (lep-hir); Peoria, *Brendel* (NYS) ("Parum differt a Lobelia spicata, et probabiliter transit in illem"; lep-or). RICHLAND: Amity, *Ridgway 3205* (ANS) (lep-hir). WASHINGTON: *French*, Jy. 1872 (NB) (lep-hir). WINNEBAGO: *Bebb*, Jy. 1858 (ANS) (lep-or). MICHIGAN: SAGINAW: Chesaning, *Dreisbach 5121* (ANS) (hir-or). WISCONSIN: ONEIDA: Virgin (?) Lake, *Hoffmann*, Aug. 1918 (Mo) (hir-ca). MINNESOTA: FARIBAULT: Minnesota Lake, *Taylor 563* (M) (hir-or). GOODHUE: Red Wing (CU) (hir-or). IOWA: DICKINSON: Lake Okiboji, *Overholts et al.*, Jy. 1926 (Mo) (hir-or). FAYETTE: *Fink 237* (US) (hir-or). LOUISA: Columbus, *Palmer 40551* (NB) (hir-or). MISSOURI: BATES: *Broadhead*, May 1871 (Mo) (hir-or). CRAWFORD: *Woodson 595* (Mo) (hir-lep-or). GREENE: Springfield, *Standley 9034* (US) (hir-lep); IRON: "eastern Iron Co.," *Trelease 669* (Mo) (lep-or). JACKSON: Waldo Park, *Bush 479* (Mo, US) (lep-hir-or); Martin City, *Bush 3038* (G, Mo, NB) (lep-hir). JASPER: Webb City, *Palmer 2095* (G, Mo, US) (lep-hir). LACLEDE: Lebanon, *Pennell 11648* (part) (ANS) (lep-or). OREGON: Alton to Thayer, *Trelease*, Jy. 1895 (Mo) (lep-or). POLK: "Stockton Road," *Trelease 449* (Mo) (lep-or). ST. CHARLES: Gilmore, *Kellogg 2026* (Mo) (hir-or). ST. FRANCOIS: Bismarck, *Dewart 72* (Mo) (lep-or). ST. LOUIS: St. Louis, *Monell*, Sep 1838 (Mo) (hir-or); St. Louis, *Eggert*, Jy. 1875 (ANS, CM, Mo, NB, R, US) (lep-or). TEXAS: Plato, *Emig 161* (Mo) (lep-or). ARKANSAS: BENTON: *Plank*, ann. 1899 (part) (NB) (lep-app ?). SEBASTIAN: Big Creek, *Demaree 3137* (ANS) (? — app). OKLAHOMA: MC CURTAIN: Idabel, *Houghton 3658* (G, Mo, NB) (app — ?). KANSAS: WABAUNSEE: *Norton and Clothier 318* (G, Mo, R, US) (lep-hir-ca). WYANDOTTE: Rosedale, *Mackenzie*, Jy. 1896 (NB) (lep-hir).

10. L. INFLATA Linnaeus, Spec. Pl. II: 931. 1753. TYPE LOCALITY: "Habitat in Virginia, Canada." TYPE SPECIMEN: There are in the Linnean Herbarium in London two examples of this plant, both seen by Linnaeus before 1753. The first is marked by him "Locus e Senegall," which is no doubt an error. The second is a flowering specimen, collected by Kalm, and marked by Linnaeus "*L. Cliffortiana.*" Photographs seen. This species, which in early flower lacks the characteristic inflated capsules, and bears a slight superficial resemblance to the southern *L. Cliffortiana* L., is probably the basis of the many reports of the latter species from Virginia:—*L. caule erecto, foliis cordatis* (Clayt. n. 196), Gronovius, Fl. Vir. 107. 1739. *L. cliffortiana* Michaux, Fl. Bor.-Am. II: 152. 1803. Pursh, Fl. Am. Sept. II: 448. 1814. *L. Michauxii* Nuttall, Gen. N. Am. Pl. II: 76. 1818. *L. caule erecto brachiato, foliis ovato-lanceolatis obsolete*

incisis, capsulis inflatis, Linnaeus, Hort. Cliff. 500. 1737. This plant was sent to Linnaeus by Gronovius, who had it from Clayton in Virginia; Linnaeus remarks on its similarity to *L. Cliffortiana,* but makes it a distinct species.—Stem erect, usually with many racemose axillary branches in age, sometimes becoming sub-corymbiform through elongation of the lower branches, 15–100 cm. high (ave. 30–60). (In sterile soil dwarf plants 10–20 cm. high are often seen; usually unbranched, bearing a few flowers and apparently maturing seed). Lower part of the stem usually purplish (sometimes green),

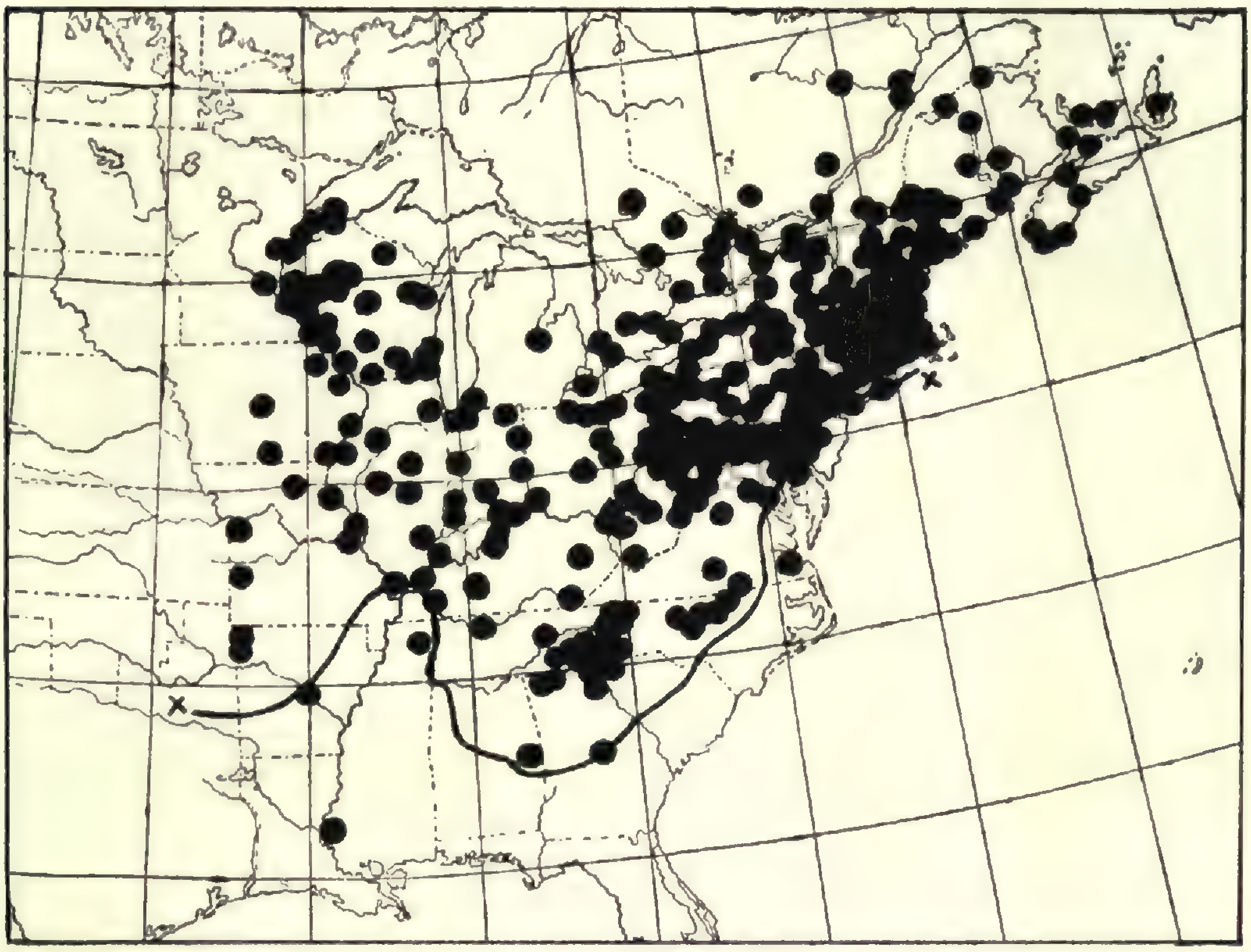

FIG. 20. Range of LOBELIA INFLATA.

upper part light green. Whole plant loosely long-hirsute (rarely nearly smooth), or the upper stem and upper sides of the leaves smooth or strigose. Hairs flat, chaffy, most numerous near the angles formed on the stem by the decurrent leaf-bases. Cauline leaves 10–25, obtuse and obovate or broad-ovate below; above ovate-oblong or ovate-lanceolate, short-acute; sessile or sub-petiolate below; irregularly rough-serrate or dentate; usually 1.5–2.5 × 4.5–8.0 cm. (sometimes larger). Upper leaves often passing gradually into the broad-leafy lower flower-bracts. Inflorescence consisting of loose racemes at the ends of the branches, the central one the largest, to 30 cm. long (usually 10–15 cm.), not secund, bearing 1–30 flowers upon slender, more or less erect, finely prickly-puberulent pedicels (5–10 mm. long

in fruit), each with a pair of inconspicuous bracteoles at the base. Flower-bracts leafy-ovate below, lanceolate or linear above, little longer than the pedicel, finely callose-denticulate, smooth or ciliate. Calyx in anthesis campanulate, smooth, becoming much inflated in fruit, oval to sub-globose, 3.5–8.0 × 7.0–11.5 mm. Capsule inferior. Calyx-lobes subulate or linear, 3.5–5.0 (8.0) mm. long, smooth or rarely slightly ciliate; auricles none. Flower inconspicuous, 8–10 mm. long, including calyx. (In this species the corolla is quite short in proportion to the calyx, being only about 7 mm. long.) Corolla violet-blue to nearly white, sometimes with a suggestion of pink which shows plainly in dried material; base of the lower lip pubescent; corolla otherwise smooth. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip oblong, shorter than the tube; the two upper lanceolate. Filament-tube 2.5–3.0 mm. long, slightly pubescent below, united ⅔ of its length above. Anther-tube 1.5–1.7 mm. long, bluish-gray, the two smaller anthers tufted at the tip, the three larger merely pubescent on the backs. Annual.

This species is readily identified in flower by the campanulate calyx, rather long calyx-lobes, and the short corolla, which seems even shorter in proportion to the large calyx. Flowering specimens are sometimes mistaken for *L. spicata*, as the branches often do not develop until fruit has appeared on the main axis. Fruit matures quickly, so that a single plant is in flower during a long period and still has only a few flowers open at a time, instead of the long flower spike of *L. spicata*.—Dry woods, fields, roadsides and waste places; an aggressive, weedy species. Prince Edward Island to Hudson Bay (Hooker, Fl. Bor. Am.) and Saskatchewan (Hooker, l. c.), south to Georgia; west to the Mississippi Valley (Nebraska, acc. to Petersen). Original habitat probably dry, rather open woods; now spreading rapidly to old fields. Rare or absent on the Coastal Plain. Flower beginning about July 1; flower and fruit through the summer. The species is so readily identified that the specimens examined are not cited.

11. L. Canbyi Gray, Man. Bot. Ed. 5.: 284. 1867. Type Locality: "pine barrens of New Jersey, especially at Quaker Bridge . . . . (also South Carolina)." Type Specimen: Material collected by W. M. Canby and by C. E. Smith at Quaker Bridge, as well as M. A. Curtis's collections from South Carolina, seen in the Gray Herbarium.—*L. Nuttallii*, in part, of early American authors. –Stem erect, tall and slender, unbranched or with few–several short racemose branches (sometimes much racemosely branched), 30–100 cm. high (ave. 60–70 cm.), smooth or sparsely pubescent and reddish below, becoming smooth and deep green above, leafy. Leaves cauline, 20–40, linear or narrowly lanceolate, 0.05–0.4 × 0.9–5.0 cm., often closely appressed, giving the plant a very slender appearance; rather thin, nearly smooth, obscurely callose-denticulate, but sub-entire in outline; the upper often merging gradually into the bracts of the raceme. Roots fibrous;

annual, acc. to Canby, in a letter to Dr. Britton, now in the N. Y. Botanical Garden. Inflorescence a loose terminal raceme 10–30 cm. long, never prominently secund, (10) 15–20 (30)-flowered. Branches, if present, bearing 2–10 flowers each, rarely as many as the central raceme. Pedicels somewhat angular, 7–11 mm. long in fruit, more or less upright, usually distinctly upwardly barbed-ciliate, each with a pair of inconspicuous bracteoles near the base. Flower-bracts linear, about as long as the pedicels, or longer, to 10–20 mm.; smooth or ciliate, callose-denticulate. Calyx in anthesis long-campanulate, rough-puberulent, becoming oval or oblong-oval in fruit, 2.5–4.0 × 4.0–7.0 mm. Capsule more or less upright, about ¾ inferior. Calyx-

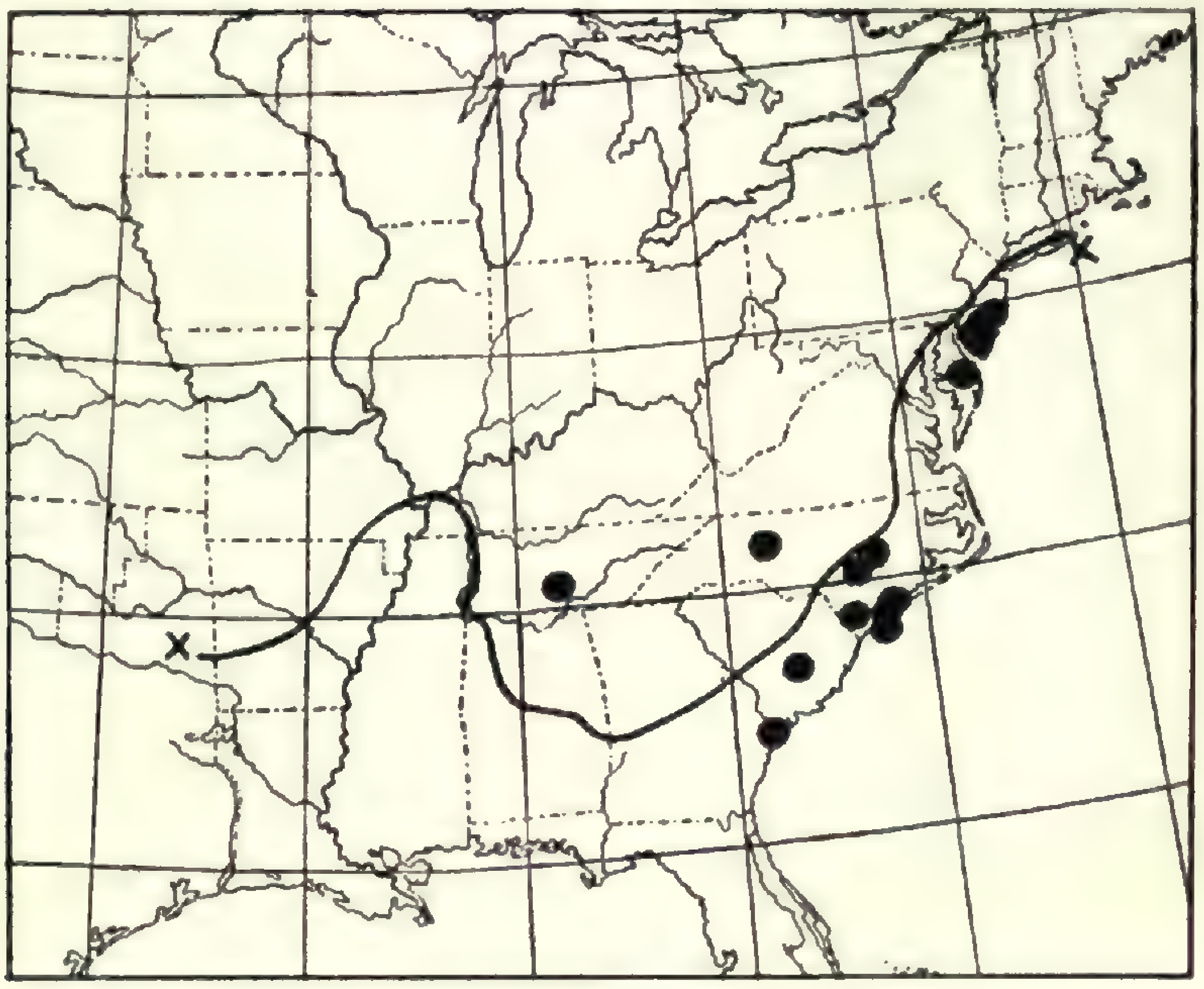

FIG. 21. Range of LOBELIA CANBYI.

lobes narrowly lance-linear, acute, 2.5–6.0 mm. long, obscurely callose-denticulate, smooth or somewhat ciliate. Auricles none. Flower 9–14 mm. long, including calyx (ave. 11–12 mm.). Corolla blue, smooth, except for the pubescent base of the lower lip. Corolla-tube entire except for the dorsal fissure; lobes of the lower lip ovate, slightly shorter than the tube; two upper lobes lanceolate, about the same length. Filament-tube about 3.5 mm. long (3–4 mm.), nearly smooth, connate more than half its length above. Anther-tube 1.9–2.1 mm. long, light bluish-gray, the two smaller anthers tufted, the three larger nearly smooth or pubescent on the backs.—Open grassy or sandy swamps, or pineland swamps; Tennessee and Georgia to the Pine Barrens of New Jersey; Appalachian Provinces or Coastal Plain, but in its north-eastern extension confined to the Pine Barrens. Flower August–September (sometimes in July). Representative material seen: TENNESSEE: COFFEE: Tullahoma, *Svenson 4245* (ANS).

Georgia: chatham: "Savanna, Aug. 17, 1908" (NC). South Carolina: orangeburg: Eutawville, *Eggleston 5000* (CM, M, NB, US). North Carolina: brunswick: Southport, *Oosting 33705* (Duke). columbus: Whiteville, *Schallert* (Duke); harnett: Erwin, *Oosting 33613a* (Duke). iredell: Statesville, *Hyams* (M). johnston: Clayton, *Blomquist 5026* (Duke). new hanover: Wilmington, *McCarthy*, ann. 1885 (US). pender: Burgaw, *Hyams*, Aug. 1879 (US). Delaware: sussex: Ellendale, *Canby* (ANS, NB, US). New Jersey: atlantic: Mays Landing, *Pennell 8113* (ANS). burlington: Speedwell, *Stone 7440* (ANS). camden: Cedar Brook, *MacElwee*, Aug. 1893 (ANS). cape may: Belle Plain, *Stone 3484* (ANS). ocean: Lakehurst, *Long*, Aug. 1908 (ANS).

12. L. Boykinii Torrey & Gray, A.DC. Prodr. Syst. Veg. VII: 374. 1839. Type Locality: "in paludibus Georgiae (Boykin) et Floridae (Chapman)." Type Specimen: authentic material, collected by Boykin, in the Torrey herbarium in the New York Botanical Garden. Aquatic, the lower stem immersed. Stem erect, slender, simple or with spreading racemose branches above, smooth, green, fistulose, 50–85 cm. high. Leaves cauline, filiform, smooth, 0.52–2.5 cm. long, few–50 or more, often deciduous, entire or obscurely callose-denticulate, the upper merging gradually into the bracts of the inflorescence. Spreading by thick creeping rootstocks. Inflorescence a lax terminal raceme, more or less secund, 7–20 cm. long, bearing 10–25 loosely spreading flowers upon slender smooth pedicels 6–17 mm. long (ave. 10–11 mm.). Bracteoles of pedicel none. Flower-bracts smooth, filiform, much shorter than the pedicels, 2–8 mm. long. Calyx in anthesis very small, round, or appearing flattish because of the spreading calyx-lobes; smooth, becoming hemispheric in fruit, about 3.0 mm. in diameter. Capsule about half inferior, somewhat longer than broad. Calyx-lobes spreading, filiform, 3.0–4.5 mm. long, entire, smooth. Auricles none. Flower 10–13 mm. long, including calyx. Corolla blue, with a white eye, smooth, or ciliate inside, the lower lip smooth or ciliate. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip oblong, short-acute, shorter than the

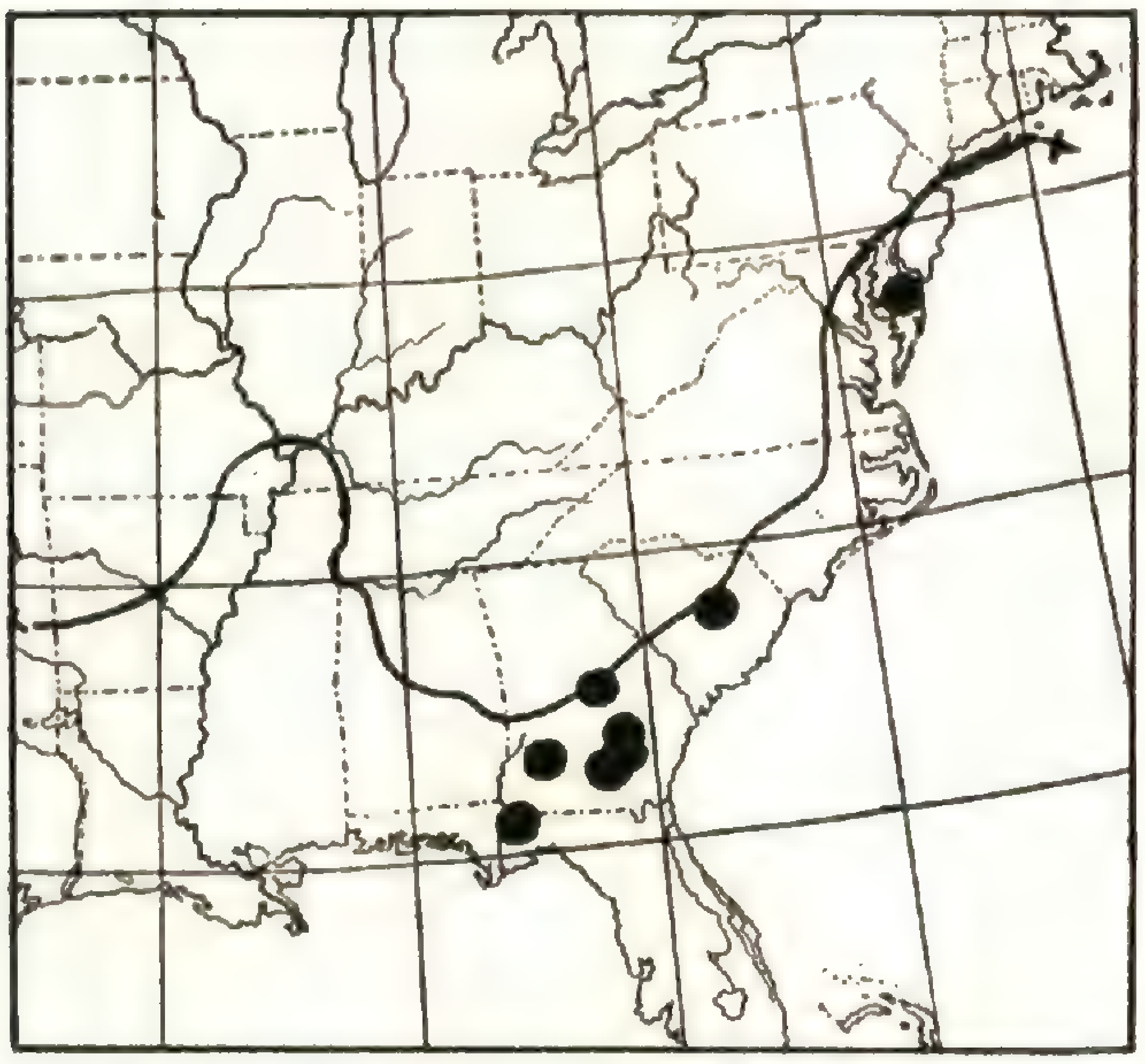

Fig. 22. Range of Lobelia Boykinii.

tube; two upper lobes long-linear, nearly as long as the tube or shorter, erect. Filament-tube 3.5–5.0 mm. long, smooth, connate above about ⅔ of its length; deflexed. Anther-tube 1.5–1.8 mm. long, bluish-gray, the two smaller anthers sparsely white-tufted at the tips, the three larger pubescent on the backs.—Pineland swamps or cypress ponds, often partially immersed; northern Florida, Georgia, South Carolina, southern Delaware; Coastal Plain. Flower May 1–June 15. Representative material seen: FLORIDA: GADSDEN: Quincy, *Chapman* (NB). GEORGIA: BALDWIN: Milledgeville, *Boykin* (ANS, NB). BERRIEN: Alapaha, *Curtiss 6819* (Del, M, NB). COFFEE: Douglas, *Harper 2199* (NB, US). LEE: Leesburg, *Earle* (Tracy 9118) (NB). TELFAIR: Lumber City, *Biltmore herb. 4167a* (M, US). SOUTH CAROLINA: SUMTER: Cane Savanna, *Stone 420* (ANS). DELAWARE: SUSSEX: Ellendale, *Long and Bartram 1636* (ANS).

13. L. APPENDICULATA A. DeCandolle, Prodr. Syst. Veg. VII: 376. 1839. TYPE LOCALITY: "Texas." TYPE SPECIMEN: collected by Drummond; seen by DeCandolle in Bentham's herbarium. Specimens collected by Drummond in Texas, now in the Gray Herbarium, are from Hooker, and are probably authentic.—In appearance and vegetative characters not to be distinguished from *L. Gattingeri* Gray except for the larger size (25–90 cm. high; ave. about 50 cm.); more numerous and larger leaves (4–15 in number, ave. 8–9); size 1–3 × 2–7 cm. Inflorescence a terminal raceme, usually distinctly secund, about 20–30 cm. long, bearing 15–70 (ave. about 30) flowers, upon short curved pedicels (4–11 mm. long in fruit), which are rough-puberulent, each with a pair of inconspicuous bracteoles near the base. Flower-bracts ciliate or nearly smooth, callose-denticulate, linear or narrowly lanceolate, 4–10 (18) mm. long. Calyx in anthesis short-campanulate or flatter, nearly smooth or puberulent, becoming long-campanulate in fruit, with a smooth inflated appearance, 4–6 mm. in diameter. Capsule ⅔–¾ or more inferior, horizontal or somewhat pendent at maturity. Calyx-lobes narrowly lance-linear, 4–8 mm. long (ave. about 5.0 mm.), densely bristly-ciliate (sometimes only near the tip); auricles conspicuous (rarely small or lacking), lanceolate-acute or broad-foliaceous, 1–3 mm. long, often white-scarious tipped; often connate; usually bristly-ciliate on the margins. Flower 10–15 mm. long (ave. 12 mm.), including calyx. Corolla light violet-blue or lilac, smooth outside, pubescent inside at the base of the lower lip. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip broad-ovate, about as long as the tube; two upper lobes shorter, lanceolate. Filament-tube 3–4 mm. long, pubescent below, connate about half its length above, somewhat deflexed. Anther-tube about 2.0 mm. long, bluish-gray, the two smaller anthers tufted at the tips, the three larger pubescent on the backs.

This plant cannot surely be separated, except by geographical range, from *L. Gattingeri* Gray. Apparent differences disappear when various series of measurements are averaged; *L. appendiculata* is a

more widely distributed plant, and consequently has a greater chance to produce extremes, which makes it seem larger on the whole. The ciliation of the calyx in *L. appendiculata* is very variable, as is the length of the auricles, and plants are found which are almost identical with *L. Gattingeri*. However, due to the very restricted range of the latter, and the fact that relatively few intermediate plants have been seen, it seems best for the present to maintain both as good species.

Usually in low sandy soils; prairies, open woods or pinelands, sometimes in dry situations; southeastern Texas to central Alabama, north to Oklahoma, northwestern Arkansas and eastern Kansas; doubtfully Illinois and Missouri. Flower April–June; earlier in the southern part of its range than in the northern. Representative material seen:

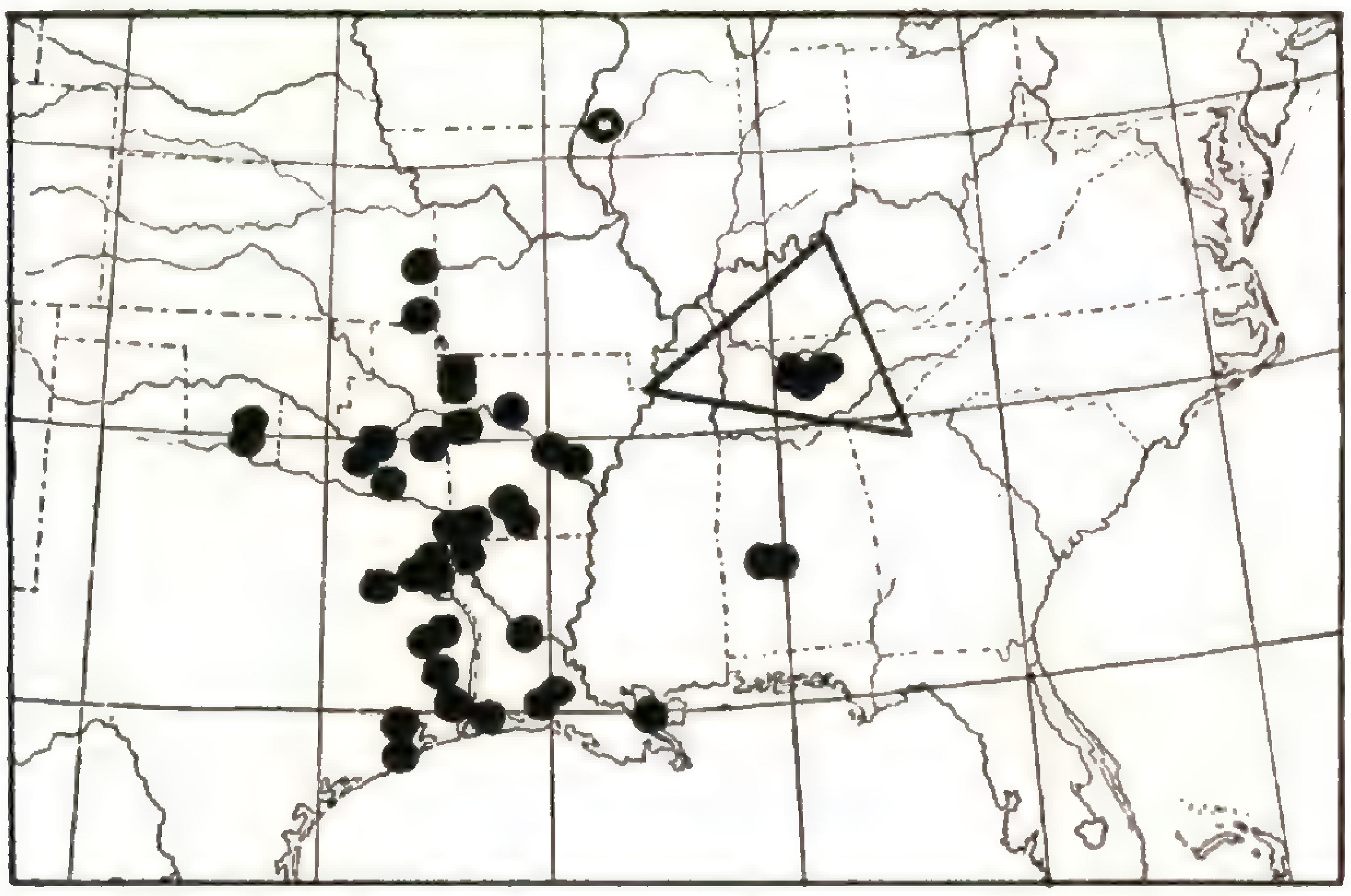

FIG. 23. Range of LOBELIA APPENDICULATA and (insert) of L. GATTINGERI.

ALABAMA: DALLAS: Marion Jct., *Mohr*, May 1893 (ANS). PERRY: Uniontown, *Mohr*, Jun. 1890 (Mo). LOUISIANA: ACADIA: Crowley, *Pennell 10203* (UP). CADDO: Rhodessa, *Palmer 27157* (Mo). CALCASIEU: Perkins, *Pennell 10214* (ANS); "Calcasieux," *Langlois*, Apr. 1884 (NYS). ORLEANS: New Orleans, *Dr. Ingalls* (NB). RAPIDES: Pineville, *Palmer 7585* (Mo, NB); Alexandria, *Ball 518* (G, Mo, NB, US). ST. LANDRY: Opelousas, *Langlois*, Apr. 1880 (M); May 1885 (UP). TEXAS: *Drummond* (G, NB); ANGELINA: Lufkin, *Biltmore herb. 8216b* (US). BOWIE: *Eggert*, Jun. 1898 (NB). CASS: Hughes Springs, *Biltmore herb. 8216a, 8216d* (US). GALVESTON: Kemah, *Fisher 378* (US). HARDIN: Fletcher, *Palmer 9574* (Mo). HARRIS: Houston, *Lindheimer*, Apr. 1842 (Mo); *Small 11812* (NB). HARRISON: Marshall, *Palmer 7920A* (Mo). SAN AUGUSTINE: San Augustine, *Palmer 9517* (Mo). TYLER: Rockland, *Neally 46* (Del, US). UPSHUR: Big Sandy, *Reverchon 2056* (Mo). VAN ZANDT: Silver Lake, *Reverchon 2085* (Mo). OKLAHOMA: ATOKA: Limestone Gap, *Butler*, May 1877 (ANS, Mo, US); Atoka, *Sheldon 57* (CU). CADDO:

(probably) "Fort Cobb to Fort Arbuckle," *Palmer*, ann. 1868 (NB, US). CHOCTAW: (probably) "Fort Towson, Ark.," *Dr. Edwards* (G). COMANCHE: Cache, *Stevens 1316* (G, M); Fort Sill, *Mrs. Clemens 11803* (Mo, R). LEFLORE: Page, *Blakley 1409* (G, M, Mo, US). PITTSBURG: McAlester, *Pennell 10601* (UP). ARKANSAS: BENTON: *Plank*, ann. 1899 (CM, NB). MILLER: Texarkana, *Eggert*, Jun. 1898 (Mo). NEVADA: Prescott, *Hollister 20* (US). OUACHITA: Camden, *Fendler*, Jun. 1850 (G). POPE: Russellville, *Pennell 10623* (UP). PRAIRIE: Hazen, *Palmer 25054* (Mo). PULASKI: Little Rock, *Engelmann 493* (Mo). SEBASTIAN: Fort Smith, *Bigelow*, ann. 1853–4 (US). WASHINGTON: Fayetteville, *Palmer 8186* (Mo, NB). KANSAS: CHEROKEE: Melrose, *Rydberg and Imler 242* (NB). MIAMI: Paola, *Oyster*, Jy. 1883 (US); this specimen is on a mixed sheet: the locality may be doubtful. MISSOURI: JASPER: Asbury, *Palmer 34664* (ANS); this specimen is hardly typical; the characters are close to those of *L. spicata*. ILLINOIS: HANCOCK: Augusta, *S. B. Mead*, Jun. 1859 (Short herb., ANS); this is a mixed sheet; two plants are surely *L. appendiculata*, while the third is close to *L. spicata* var. *hirtella*.

(*To be continued*)

DATES OF PUBLICATION OF RYDBERG'S FLORA OF THE ROCKY MOUNTAINS AND ADJACENT PLAINS

M. L. FERNALD

IN a recent reorganization of the letter-file at the Gray Herbarium many letters and memoranda of great historic and bibliographic importance have come to light. Some of these concern the dates of issue of Rydberg's Flora. The 1st edition bears on the title-page the date 1917 and the Preface bears the date November, 1917. A copy, subscribed for in advance, was received at the Gray Herbarium on March 5, 1918. Consequently, the communications from Rydberg to the late Mary A. Day regarding the date of issue are significant. Miss Day, editing the Gray Herbarium Card Index, had perpetual difficulty in establishing exact dates of publication. Rydberg's two communications are sufficient indication of this. The first, a card postmarked February 22, 1918 at 7 p. m., follows:

Dear Miss Day:

I have received your two letters and have entered the subscription for the Flora. I have received only 23 copies which were brought here by the manager of the printing house as baggage. I received a notice a month ago that the other books were shipped but received a notice a few days later that there was an embargo on local freight except food. God knows when they will come. I shall send you a copy as soon as I can.

Yours very truly,
P. A. RYDBERG.

This was followed by a longer letter:

New York, March 7, 1918.

My Dear Miss Day:

I have received your letter asking for the exact date of publication of my Flora of the Rocky Mountains. The date that I claim as the date of publication is December 31, 1917. I was promised by the bindery to get some bound copies with me to the meeting of the A. A. A. S. at Pittsburg. I called at the bindery in Philadelphia on the morning of December 27th. Some copies were practically bound except that the covers had not been attached. They promised to make them ready the same day. I brought a copy in paper cover to the Pittsburgh meeting, and got orders for about 20 copies.

Dr. Britton received a bound copy on December 31, and I know at least one other person that received a copy on the same day. As I was away a week the rest were not delivered until the first part of January. Then the government put an embargo on local freight, and the bindery could not send the rest of the books. I ordered them to send 50 or 100 copies by express but they did not do so. Then the books were shipped to Philadelphia on February 1, but I did not get them to my place in New York before a month later. The 23 copies that were delivered in December and the early part of January were brought to New York as baggage by the manager of the printing concern.

As some of the books at least were bound on December 31, and at least 2 copies were received by the customers on that date, I think that I have the right to claim that date as the date of publication. Several more had already been sold although it had been impossible to deliver them on that date. . . .

Sincerely yours,
P. A. Rydberg.

Article 36 of the International Rules reads:

Art. 36. Publication is effected, under these Rules, by sale to the general public or to botanical institutions, of printed matter or indelible autographs, or by distribution of these to specified representative botanical institutions.

No other kind of publication is accepted as effective: communication of new names at a public meeting, or the placing of names in collections or gardens open to the public, does not constitute effective publication.

Miss Day, anxious to please, entered 1917 on the cards, but the requirements of the International Rules regarding effective publication were not actually met until early in 1918. When rival names published late in 1917 appear the date of *effective* publication of the first edition of Rydberg's Flora will become highly important.

Now as to the 2d edition. The date on the title-page is 1922, but copies were not available until 1923. The following letter makes this clear.

New York, February 21, 1923

Dear Miss Day:

A few days ago I sent a copy of the second edition of my "Flora" to you, and enclose herewith the bill for the same. As to the date of publica-

tion of the book, I am rather in doubt. The book was ready for delivery in the beginning of December, but I received a notice from the binder that they had sent the books to the station in Lancaster on December 6th. A week or so afterwards I received a notice that the Pennsylvania Railroad had put an embargo on freight and that printers had removed the boxes to the Lehigh Valley Railroad. At the time I already had orders for several copies, that, of course, could not be delivered. At the Association meeting in Cambridge in December, I met Mr. Urban and he stated that the Lehigh Valley Railroad had accepted the freight but had held up the shipment just as the Pennsylvania Railroad. I received another letter dated January 3d, enclosing the shipping bill, but did not receive the books before the 21st of January, when the first customer received a copy. Now, the question is, what is the date of publication? The books were ready for shipment in December, but on account of the embargo on freight in order to favor coal shipping, I was incapable of delivering any books until late in January. The book bears on the title-page 1922, and if the date of actual publication is set to the 21st of January, the title page is a liar! You can do just as you please.

Very truly yours,
P. A. Rydberg.

Without repeating Rydberg's pointed commendation of the title-page of his 2d edition to the Ananias Club, it is clear that one can not do just as he pleases. The specific statement that he "did not receive the books before the 21st of January [1923], when the first customer received a copy" sufficiently answers Rydberg's not very logical question as to "what is the date of publication?". Certainly any author of a competing name effectively published prior to January 21, 1923, has the right-of-way. Rydberg was truly unfortunate in encountering, first, war-conditions and, second, a coal strike. Should competition of names arise, it will be important to have the above letters from him on record.

EUPHORBIA PILULIFERA IN MICHIGAN

Oliver A. Farwell

Tons of this plant are annually imported from India for the purpose of manufacturing it into medicine. I have found a plant on waste grounds at Detroit that is this species. Undoubtedly seed has fallen from the bales as they were unloaded from the cars or while on their way to the factory. The plant imported is pubescent with conspicuous yellow hair. In the Detroit plant, the bright yellow of the pubescence is in the main conspicuous by its absence. It was first observed and collected at Detroit, September 5, 1930, no. 8756. It

spread somewhat the two following years but 1933 seemed to be a poor year for it. I left Detroit that year and cannot say if it has maintained its foothold or not. The imported plant is large and much branched. The plant, as it is found in Detroit, is small and simple with mainly a colorless pubescence, due probably to the unsatisfactory location and poor soil, probably not of the proper character to produce vigorous plants.

There seems to be considerable difference of opinion as to what name this species should bear. N. E. Brown in the Flora of Tropical Africa, vi.[1] 497 (1911) adopts *E. hirta* L. on the grounds that the herbarium specimen of Linnaeus labeled *E. pilulifera* was the type of the Linnean description of *E. pilulifera* and that the herbarium specimen is *E. parviflora* L., one of the forms of the polymorphous *E. hypericifolia* L.; hence, *E. hirta* L. is the proper name for it since *E. pilulifera* becomes a synonym of *E. hypericifolia* L.

Thellung in Ascherson & Graebner's Syn. Mitteleurop. Fl. vii. 424, 425 (1916) declines to accept the argument of N. E. Brown on the ground that Linnaeus had no description of his own in the Sp. Pl. i. 454 (1753) of *E. pilulifera*, hence the herbarium specimen could not be the type. He accepts the citation of Burman Thes. Zeyl. 224, t. 105, fig. 1 as the type of *E. pilulifera* L. This makes it synonymous with *E. hirta* L. published on the same page; as Grisebach first united these two species under the name of *E. pilulifera* and was followed by Boissier in DC. Prodr., *E. pilulifera* L. is the proper binomial to use. Thellung agrees with N. E. Brown only in calling the Linnean herbarium specimen *E. parviflora* L. The premise of N. E. Brown is wrong from the start, for he is forcing upon an ancient botanist a "type" for his species when that botanist had no type and knew not the meaning of the word as it is expounded by botanists of the current times. One of the citations must be the type of the species; long-established custom has made it the Burman citation which makes it synonymous with *E. hirta* L.; and as shown by Thellung *E. pilulifera* is the proper name to use. *E. hypericifolia, E. hirta* and *E. pilulifera* were published by Linnaeus on the same page and in the order just given.

Lake Linden, Michigan.

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H pl437.38

NAJAS MINOR: plant, × ⅖, from New York.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 38. October, 1936. No. 454.

STUDIES IN THE GENUS NAJAS IN THE NORTHERN UNITED STATES

R. T. Clausen

(Plates 437 and 438)

During the last few summers, while investigating the aquatic vegetation of some of the waters of New York for the New York State Conservation Department, Division of Biological Survey, Dr. W. C. Muenscher and the writer have collected a considerable amount of material of species of *Najas*. These collections, including one old world species previously unknown in North America, afford us a much fuller picture of the distribution of the genus in New York than has been previously possible. The writer has also had opportunity to collect in various parts of New Jersey, where several new stations were discovered for the rarer species of *Najas* in that state. This field work has led to a rapid survey of the material of *Najadaceae* preserved in the larger eastern herbaria. All of the collections of *Najas* available at the Gray Herbarium, the National Herbarium, the herbarium of the New York Botanical Garden, and the herbarium at Cornell University have been examined. The writer wishes here to express his appreciation to the authorities of these institutions for the privilege of availing himself of their facilities. As a result of these herbarium studies, it has been possible to gain a general idea of the ranges of our North American species of *Najas* as they are at present known.

Najas has probably been as much misidentified and misplaced in herbaria as any group of the narrow-leaved type of aquatics. It is not unusual in going through a collection of this genus to find placed

in the covers labelled *Najas*, specimens of genera of the *Characeae*, narrow-leaved *Potamogeton, Zannichellia, Lagrosiphon, Elodea,* and even *Ceratophyllum*. Consequently one is never sure that he has seen all of the material in a given herbarium, because there is always the possibility of specimens of *Najas* being misplaced in the covers of any of these other genera. A student of *Najas* must be prepared to look in a variety of places for the objects of his study.

Important contributions to the knowledge of the genus have been made by Magnus,[1] Rendle,[2] and Fernald.[3] Magnus was particularly interested in the anatomy of the group. His thesis for the degree of Doctor of Philosophy from the University of Berlin was a "*Beitrage zur Kenntniss der Gattung Najas L.*" Prof. Fernald has called attention to the best characters by which the northern North American species may be recognized and has defined their ranges. Rendle's monograph represents the most recent attempt to treat the *Najas* flora of the world. He provided keys and detailed statements of ranges as they were known at the time when he was writing. He listed four species as native to North America; *N. marina, N. flexilis, N. microdon* (*N. guadalupensis*), and *N. gracillima, N. conferta,* now known from southern Florida, was reported by him from Cuba and Brazil. *N. minor,* which is now recorded from North America, was noted from Europe, Asia, and northern Africa. Since Rendle's paper, no new species of *Najas* has been described from North America until 1935, when Rosendahl and Butters[4] published *N. olivacea* from Minnesota. In the following discussion this species will be mentioned under *N. guadalupensis.*

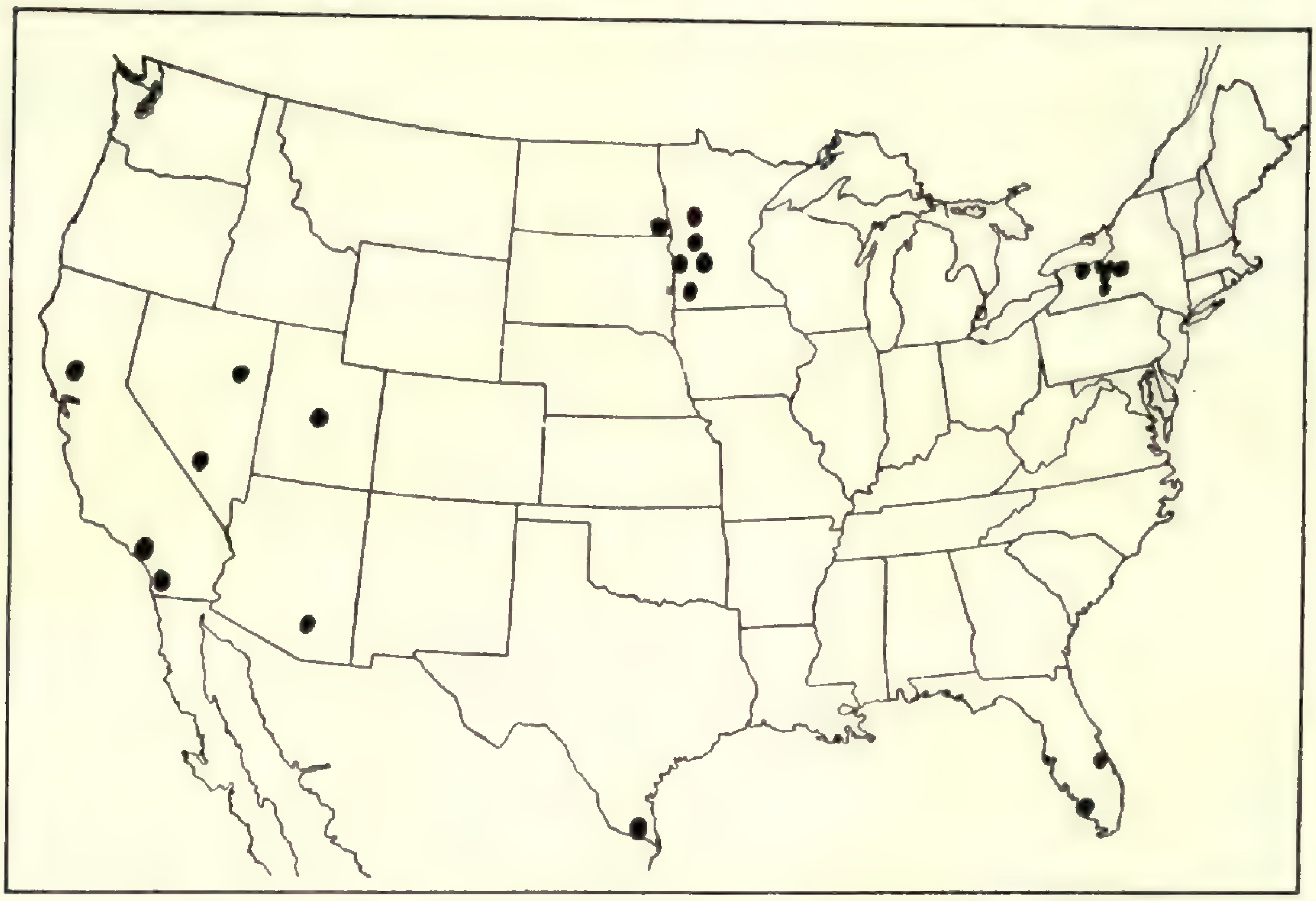
In preparing a key to our northeastern forms, it was found that characteristics such as length and breadth of seeds, leaves, and stems, though often of great help relatively in making determinations, are subject to great variation. Statements of size to tenths of millimeters are of little value when measurements of structures in the same species may vary several whole millimeters plus or minus.

Key to the Northeastern North American Species of Najas

1. Leaves coarsely and conspicuously toothed (spines discernible without a lens). Internodes and backs of leaves often spiny. Seeds large, usually 4–5 mm. long, 2–3 mm. wide, finely reticulate. Plants dioecious . . . . *N. marina.*
1. Leaves almost entire or finely toothed (spines usually not discernible without a lens). Internodes and backs of leaves never spiny. Seeds more slender and smaller, 4 mm. long or less, 2 mm. wide or less. The seed-coat variously reticulate. Plants monoecious . . . . 2.

2. Leaf-bases broadly and truncately lobed or auriculate....3.
   3. Leaf-bases broadly and truncately lobed. Areolae of seed-coat much broader than long, arranged in regular vertical rows. Leaves somewhat recurved............*N. minor.*
   3. Leaf-bases auriculate and scarious, decidedly spiny-toothed. Seeds very slender, often with a slight tendency to be curved. Areolae longer than broad, sunken in, giving the seed-coat a decidedly roughened appearance. Leaves not recurved......................*N. gracillima.*
2. Leaf-bases not broadly and truncately lobed or auriculate, but little enlarged and sloping....4.
   4. Seed-coat smooth and lustrous, very finely reticulate (30–40 rows of areolae across the seed). Styles long and filiform, 1 mm. or more long. Leaves finely and closely spined......................................*N. flexilis.*
   4. Seed-coat dull, coarsely areolate, 10–20 rows of areolae across the seed. Styles short and stout, 0.5 mm. long or less. Leaves usually finely, but remotely spined. *N. guadalupensis.*

N. MARINA L. Prof. Fernald[5] has well discussed the distribution of this species in New York state. Since 1923 no new collections of *N. marina* have been made in the Atlantic coastal region north of



MAP. 1. Range of NAJAS MARINA in the United States.

Florida, although the species might be expected to be found in many places between New York and Florida.

In the middle western region, particularly in Minnesota and in North Dakota, a number of collections have been made. Rosendahl and Butters[6] mention the occurrence of *N. marina* at Lake Minne-

waska, Pope Co. and at Big Stone Lake, Big Stone Co., Minnesota. Other collections from this state include: *I. V. Shunk & W. E. Manning* 539, North Ten Mile Lake, Ottertail Co.; *Jones & Hotchkiss* 4002, Upper Norway Lake, Kandiyohi Co.; *F. P. Metcalf* 1966, Kandiyohi Lake, Kandiyohi Co.; *F. P. Metcalf* 1986 & 1972, Wagonda Lake, Kandiyohi Co.; and *F. P. Metcalf* 1841, Glacier Lake, Murray Co. Metcalf has also collected this species at Elsie Lake (M. 60) and at Mud Lake (M. 148), both near Hankinson, North Dakota.

No material from Michigan has been seen.

From Florida the writer has studied material from two different stations: *A. H. Curtiss* 2705, Palm Creek near Cape Romano; and *E. Palmer* 533, Sand Point, Indian River. Morong's var. *gracilis*, exemplified by the Palm Creek collection of Curtiss and by part of the Palmer collection, seems merely to be a narrow-leaved form of the typical *marina*. The rest of the Palmer collection is the broad-leaved form which matches exactly specimens from central New York.

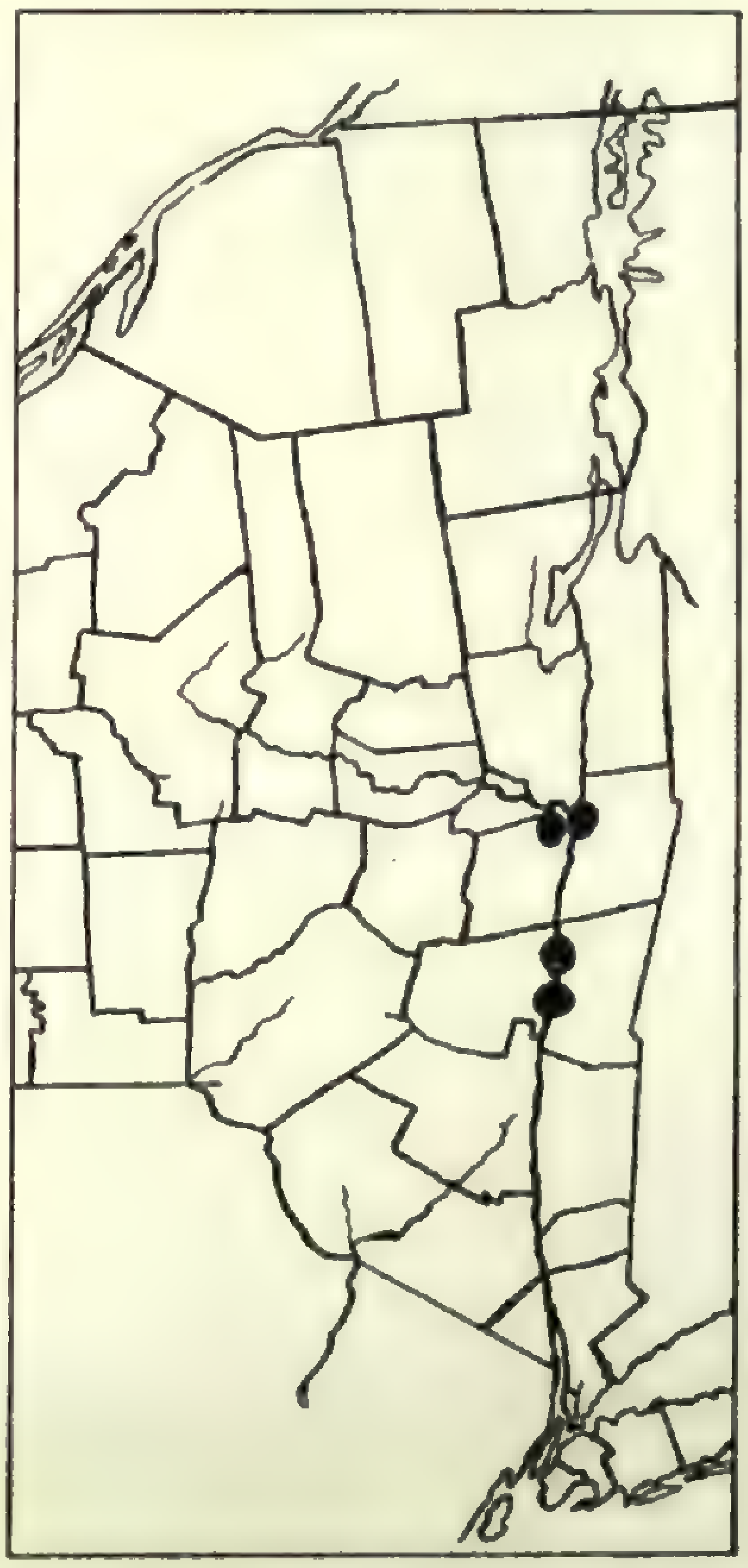
West from Florida, the species has not been collected any nearer than 15 miles north of Brownsville, Texas, where it was secured by *Robert Runyon*, no. 187. Another Texan collection is "Las Frosnos in Risoco," *Runyon*, no. 185. From the West material has been seen from the Santa Cruz River in Arizona; Central Utah; Ash Meadows and the Huntington Valley in Nevada; and from three stations in California, the northernmost of these being *H. N. Bolander*, 2658, Clear Lake, Lake Co.

Material of *N. marina* has also been examined from Lower California; Guaymas, Sonora, Mexico; Cuba; Haiti; Porto Rico; Salvador; Venezuela; France; Norway; Sweden; Germany; Austria; Hungary; Italy; Sicily; Egypt; Belgian Congo; Asia Minor; Afghanistan; India; Manchuria; Japan; Hawaiian Islands; and Galapagos Islands. Rendle has described many geographical varieties, but attempts by the writer to place the forms from the aforementioned localities in their respective regional races has proved highly unsuccessful. So much material is now available as to break down the fine distinctions made by Rendle, who evidently had only single specimens in many cases on which to base his varieties. A detailed study of the forms of *N. marina* must be carried out before specific statements may be made as to the subdivisions of the species and their distribution.

N. minor Allioni. While collecting in the waters of the Hudson River at Troy and Waterford, at the mouth of the Mohawk River,

on August 21 and 22, 1934, great beds of a strange species of *Najas* were discovered by Dr. W. C. Muenscher and the writer. The plants were bushy and much branched, growing in shallow water, and had a characteristic appearance because of the recurved habit of the foliage. The leaves were slender, but not so much so as in *N. gracillima,* and relatively coarsely spined. A week later, we found the same plant growing on a tidal mud-flat about one mile south of Stuyvesant, Columbia Co., New York. Finally, on September 3, we found the plant in the Watervliet Reservoir in Albany Co. See PLATE 437.

When we worked over our 1934 collections later in the year, we were puzzled by the specimens of this *Najas.* Was it an aberrant form of *N. gracillima,* a new species, or another tropical or sub-tropical form, which, like *N. guadalupensis,* was reaching its northern limits in our area? The scarcity of fruits on our specimens served to support this last line of reasoning. The writer tried to match the specimens with material of *N. conferta* from Florida, but this did not work at all. Turning through Rendle's treatment in Engler's "Das Pflanzenreich," we noted fig. 1 D, showing the habit of *N. minor,* and fig. 4 S and T, showing the seeds, fresh and fossil, of the same species. Here was our plant depicted, with the same habit and transversely reticulate seeds as had been observed in the Hudson River material! Our plants matched exactly European specimens of *N. minor.*



MAP 2. Range of NAJAS MINOR in New York.

Although the 1934 material exhibited a paucity of fruits, collections at Troy and Waterford in September, 1935, by W. C. Muenscher and O. F. Curtis, jr. contained specimens which were abundantly fruiting.

Recalling Svenson's[7] collection of *N. gracillima* in the shallow water of the Hudson above Waterford, we wondered whether this might not also be *N. minor.* Examination of this material at the Gray Herb-

arium, however, showed it to be typical *N. gracillima*. A search through the *Najas* material of several eastern herbaria failed to reveal any further specimens of *N. minor* from North America. Specimens from the herbarium of George Engelmann of St. Louis, Mo. were collected by A. Braun in Berlin, in 1865.

Najas minor is undoubtedly of recent introduction in New York. The fact that none of the many other botanists who have worked over this area had ever collected it would seem to support this view. There are several ways by which the plant may have come in. Seeds or parts of the plants themselves may have been brought here on shipping from Europe. There is even the possibility that the plant had been grown in an aquarium and then dumped into the river. Intentional introduction is possible but not likely. On September 14, 1935, Dr. W. C. Muenscher threw fragments of plants of *N. minor* into the shallow water of Cayuga Lake off the Canoga Marshes. *Najas marina* is common in this part of the lake. Whether *N. minor* will thrive there remains to be seen.

In the herbarium, *N. minor* may be at once recognized by its very narrow, coarsely toothed leaves, with broadly truncate bases. The seeds are slender, 2–3 mm. long and .4–.6 mm. wide, with vertical rows of numerous areolae, which are much broader than long, giving the seed-coat a scalariform appearance.

The following collections, all in New York, may be cited: *Muenscher and Clausen* 4279, mouth of Mohawk River at Waterford, Saratoga Co., August 21, 1934; *M. & C.* 4281, mouth of Mohawk River at Waterford, Saratoga Co., August 22, 1934; *M. & C.* 4282, Watervliet Reservoir, Albany Co., September 3, 1934; *M. & C.* 4280, tidal mud flat about one mile south of Stuyvesant, Columbia Co., August 28, 1934; *M. & Curtis* 4825, backwater of Mohawk River, Waterford, Saratoga Co., September 10, 1935; and *M. & Curtis* 4826, junction of Mohawk and Hudson Rivers, Troy, Rensselaer Co., September 10, 1935. Plants of *N. minor* were also found on the mud-flat in the river between Hudson and Athens, in Greene Co. Unfortunately, the material from this station was not preserved.

Material of *N. minor* has been examined from France, Germany, Austria, Hungary, Egypt, India, the Malay Peninsula, and Japan.

N. gracillima (A. Br.) Morong. The experience of intensive collecting during the last few years would seem to indicate that *N. gracillima* is not nearly so localized as was first supposed. The plant

is very characteristic in appearance and can not be confused with any of the other native species of the genus, although certain puzzling forms, possibly of hybrid origin, can not be satisfactorily placed.

In New York, *N. gracillima* was first collected in the ponds west of Albany by C. H. Peck. Since then it has been found at several places on Long Island and in the watersheds of the Hudson, Mohawk, Indian, Grass, Raquette, Delaware, and Susquehanna Rivers. It has also been collected in the Lake Champlain watershed. In 1934, Muenscher and Clausen[8] listed several inland stations in New York for *N. gracillima*. To these may now be added the following: *M. & C.* 4274, Middle Stoner Lake, Fulton Co.: *M. & C.* 4275, Canada Lake, Fulton Co.; *M. & C.* 4276, East Caroga Lake, Fulton Co.; *M. & C.* 4277, Lily Lake, Fulton Co.; and *M. & C.* 4278, Glass Lake, Rensselaer Co. In 1935, Muenscher and Curtis collected the species in two new localities; M. & C. 4822, Mutton Hill Pond, Apalachin, Tioga Co., in the Susquehanna Watershed; and M. & C. 4828, Round Lake near Roscoe, Sullivan Co., in the Delaware Watershed. In the Gray Herbarium is a collection by H. K. Svenson, no. 1904A, from Franklin Co., N. Y. This is a single fragment of *N. gracillima* collected with Potamogeton in the shallow water at the north end of Loon Lake on Aug. 24, 1927.

Map 3. Range of Najas gracillima.

M. & C. no. 4275, from Canada Lake, Fulton Co., N. Y. consists of two things collected together and growing side by side. The one is typical *Najas gracillima*. The other is a slender form with *flexilis*-like fruits. The seeds are 2–2.2 mm. long, the seed coats smooth and polished, and the style in flowering material 1.5 mm. long. The sheath of the upper leaf at each node is lobed and sharply toothed with 6–8 slender spines. The leaves and stems are capillary. This material may be either *N. tenuissima*, a European species native in Finland, which it matches pretty well, or a hybrid between *N. flexilis*

and *N. gracillima.* There seems to be no good reason why species of Najas should not cross, although no examples of this have until now been described. Certainly our Canada Lake specimens seem to be entirely intermediate between the two above species. M. & C. 4265, from Pine Lake, Fulton Co. exhibits this same intermediate character.

Inland in Massachusetts *Najas gracillima* is now known from Wood Pond, Ludlow, Hampden Co., where it was collected on the muddy pond bottom by F. C. Seymour, no. 427, on Aug. 25, 1925. It has also been collected in a pond at Deerfield, Franklin Co. by Walter Deane, on Aug. 10, 1887.

In New Jersey Svenson[9] collected *N. gracillima* in a pond hole east of Cedar Lake. In his note in Rhodora he also mentioned the four other classical New Jersey stations for the species: Delanco, Burlington Co.; mouth of Cooper's Creek, Camden Co.; Palatine, Salem Co.; and Woodstown, Salem Co. The writer has seen material from all of these stations except the one at Palatine. There are two other collections from the state which until now have apparently been overlooked. These were both by K. K. Mackenzie; no. 5691, shores of Delaware River at Kinkora, Burlington Co., Sept. 1913; and no. 6288, south end of Denmark Pond, Morris Co., Sept. 13, 1914. Sheets of these numbers are deposited in the herbarium of the New York Botanical Garden.

In 1935, *N. gracillima* was collected in a small sandy bottomed bay at the southern end of Green Pond, Morris Co., N. J., A. P. & R. T. Clausen, no. 1191. Here the species was growing in the typical association with which it was found in the Adirondack Lakes: *Isoetes Braunii, Potamogeton capillaceus, Eriocaulon septangulare, Brasenia Schreberi, Elatine minima, Utricularia purpurea,* and *Lobelia Dortmanna.*

Specimens collected by Taylor at Spotswood, Monmouth Co., N. J. and labelled *N. gracillima* are definitely not Najas. Material in the Mackenzie Herbarium labelled *N. gracillima* from Catfish Pond, Stillwater, Sussex Co., N. J. is *Potamogeton pectinatus.*

From Pennsylvania, *N. gracillima* is known from Bristol, Bucks Co. (Diffenbaugh, July 26, 1868) and from the Lehigh River at Easton, Northampton Co. (Morong, Aug. 7, 1891).

In the Atlantic coastal region, *N. gracillima* is also known from Delaware and Maryland. The following sheets may be cited: A. Commons, in Nanticoke River at head of tidewater, Seaford, Sussex

Co., Delaware, Aug. 31, 1882; Forrest Shreve and W. R. Jones 1200, Shad Point, Wicomico River, Wicomico Co., Md., Aug. 17, 1906; and W. L. McAtee 2766, pool at Widewater, Great Falls, Montgomery Co., Md., Aug., 1917.

W. N. Keck and C. F. Stillwell, no. 380, first collected *N. gracillima* in Minnesota on Aug. 2, 1926, at Dudley Lake in Rice Co. A year later, Rosendahl,[10] no. 5509, collected the species in a small lake in northwestern Ramsey Co. There are also three stations for Wisconsin.[11] In the herbarium of the New York Botanical Garden are some specimens of *N. gracillima* sent in a letter from Dr. Gray to Wm. Boott. These may have been obtained in Michigan, although there is some doubt about this possibility. Search should now be made for the plant in the area between Tioga Co., N. Y. and Wisconsin.

N. FLEXILIS (Willd.) Rostk. & Schmidt. This species, common in the northeastern part of the United States and eastern Canada, is exceedingly variable in appearance. In small, shallow ponds, it often assumes a squat bushy character, while in the waters of our rivers it develops long slender stems with slender leaves and even more slender fruits. There is great variation in the size and shape of the seeds of *N. flexilis*. The writer has tried to break up the species on a basis of seed characters, but all his attempts thus far have been unsuccessful. It was first thought that the coastal plain forms exhibited short plump seeds, while the inland forms had more slender, elliptical seeds. There are so many specimens available to disprove this idea that it had to be abandoned. Different forms of the species do occur, but the characters, such as width of leaves, size and shape of seeds, and habit, occur in all sorts of combinations and can not be correlated with geographical areas to give definite geographical races or varieties which are worth naming.

Prof. Fernald[12] stated that to the west of Iowa and Minnesota the species seems to be only in Idaho, Oregon, Washington, and British Columbia. I have at hand only two records for the area in between, and these both from South Dakota, adjoining Minnesota: Corbett and Williams, no. 12, in shallow water of Lake Hendricks, Aug. 8, 1894; and C. & W., no. 178, shallow water of Big Stone Lake, Aug. 15, 1894. The collection of F. P. Metcalf, no. 867, from Bull Lake, Boone Co., Missouri, seems to be *N. flexilis*, but material examined from Kansas and Nebraska seems to be highly questionable.

In the east, the southern limits of the range of *N. flexilis* are still

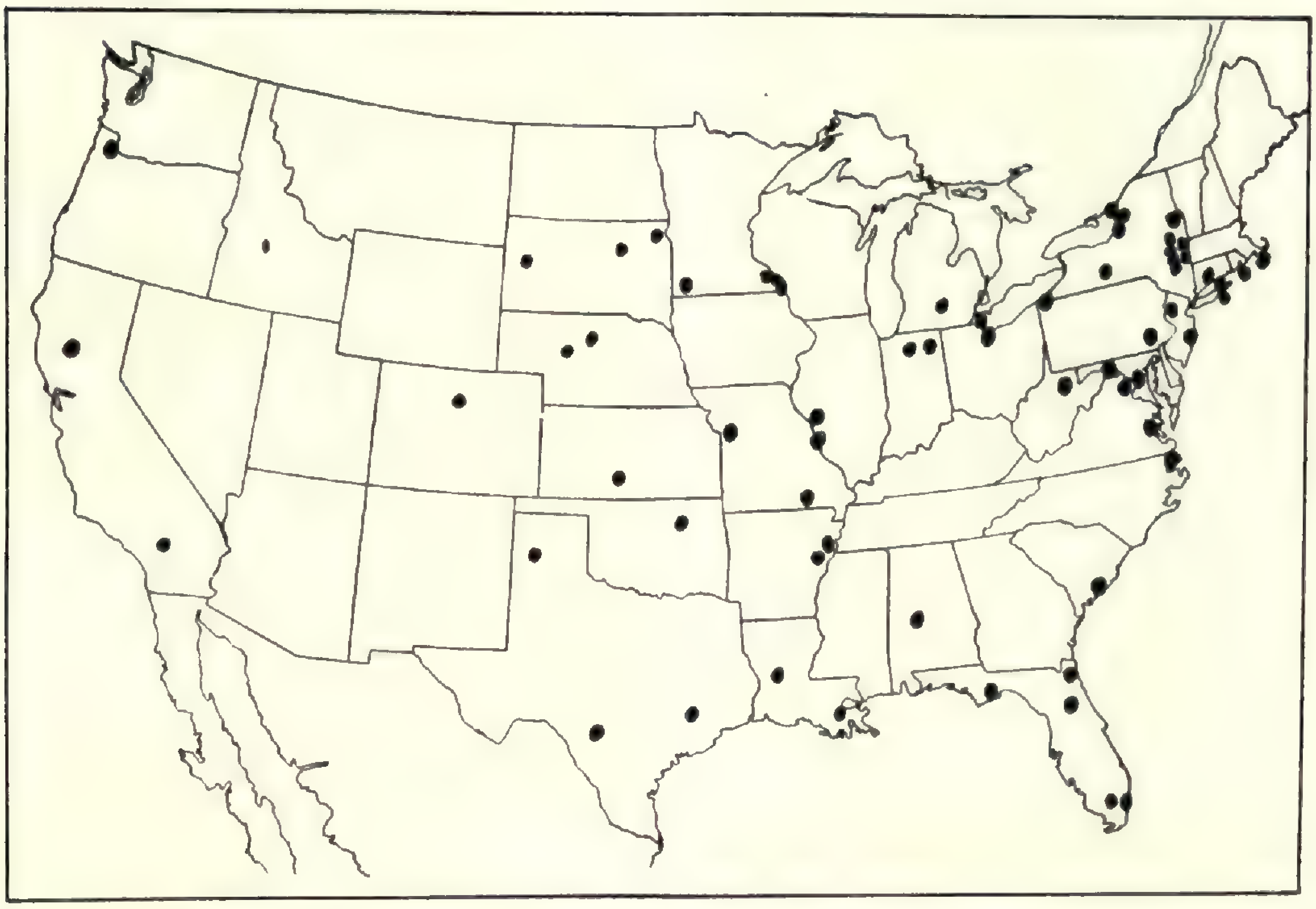
poorly worked out. The collection, no. 2275 of W. L. McAtee, from Hunting Creek, Va. may possibly be *N. flexilis*, but the condition of the material is such that positive determination is well nigh impossible. There is a doubtful specimen from the vicinity of Washington, D. C., collected by Vasey in 1875. There is also another District of Columbia specimen which has much the appearance of *N. guadalupensis*, but styles 2 mm. long. Such specimens are difficult to place. The collection, Muenscher and Clausen no. 4273, from the mouth of the Mohawk River where it enters the Hudson at Waterford, Saratoga Co., N. Y., presents the same difficulty. The seeds are decidedly of the *flexilis*-type, 3.5–4 mm. long (!), the styles 1–1.2 mm. long, with the habit suggesting *N. guadalupensis*.

In New Jersey, on the coastal plain, Edwards and Clausen (1190) collected *N. flexilis* as far south as Toms River, Ocean Co., on the edge of the pine barrens. Material of *N. flexilis* has been examined from Newfoundland, Quebec, Ontario, New Brunswick, Nova Scotia, Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Maryland, Ohio, Indiana, Michigan, Illinois, Minnesota, Iowa, South Dakota, Missouri, Idaho, Oregon, Washington, British Columbia, Sweden, and Germany.

N. guadalupensis (Sprengel) Morong. This seems to be an aggregate species. Certainly the material usually classified in herbaria under this name presents a decidedly heterogeneous aspect. Here as in *N. flexilis*, however, attempts by the writer to break up the species have been unsuccessful.

N. guadalupensis is a new world species, extending southward from Massachusetts, New York, and Quebec to Peru, Bolivia, and Argentina. In the northern part of its range, the species had been for a long time overlooked, probably partly because in the north it seldom produces fruit. Prof. Fernald[12] called attention to its occurrence in our northeastern flora and pointed out the characters by which it might be recognized; the short stout style and the dull, coarsely reticulate seed coat. In New York the plant was mentioned from Suffolk Co., L. I. and from Jefferson Co., at the extreme eastern end of Lake Ontario. A considerable number of New York collections have been made since 1923. These are cited here: Muenscher, Manning and Maguire 180, in deep water of South Bay, Lake Champlain, Fort Ann, Washington Co.; Muenscher and Clausen 4283, mouth of Mohawk River at Waterford, Saratoga Co.; M. & C. 4284,

Nassau Lake, Rensselaer Co.; M. & C. 4285, Kinderhook Lake, Columbia Co.; M. & C. 4286, tidal mud flat in Hudson River between Hudson and Athens, Greene Co.; M. & C. 4287, tidal mud flat in Hudson River at Coeymans, Albany Co.; M. & C. 4288 & 4289, tidal mud flats in Hudson River at mouth of Stockport Creek, Columbia Co.; and C. 1192, 1193, and 1194, Waneta Lake, Schuyler-Steuben Co. *Najas guadalupensis* is one of the commonest species of aquatics



Map 4. Northern Range of Najas guadalupensis.

in Waneta Lake, a small body of water, about three miles long, on the divide between the Ontario and Susquehanna watersheds. This lake naturally drained into the Susquehanna valley, but it has recently been diverted so that it now flows through a canal into Keuka Lake and thence into Ontario. Large quantities of the Najas collected here were almost entirely sterile. Only rarely were flowers found which made positive identification possible. Some of the Rensselaer County material contained fruits more commonly. The seeds were typical of those produced on plants from the southern states.

In New Jersey, *N. guadalupensis* has seemed to be a great rarity. No specimens have been seen in herbaria and there are no published references to the species. Consequently, two recent collections seem worth recording: Edwards and Clausen 1195, shallow sandy pool

along the Atlantic coast at Mantoloking, Ocean Co.; and Edwards, Bowen, Highton, Rusling, and Clausen 1196, Budds Lake, Morris Co.

On Aug. 2, 1933, Muenscher and Lefler collected a peculiar Najas (18239) in three to four feet of water off the Canoga Marshes in Cayuga Lake, N. Y. Specimens of this collection have been studied by the writer. The plants are slender, 40 cm. long or more, and somewhat bushy, rooting at the nodes. The leaves are lanceolate, abruptly acute, broad and sheathing at the base, and finely and sharply toothed with 50–75 teeth on a margin. The sheath of the upper leaf at each node is wider than that of the lower, and the sheaths are about 3 mm., with their margins finely spined, 8–12 spines on a side. The material is absolutely sterile.

In 1934 and again in 1935, attempts to rediscover the station for this plant and to secure fruiting material were spoiled by adverse weather conditions. The lake was so rough when we visited the spot in 1935 that we could not see anything in the water.

This Cayuga Lake material seems most closely related to *N. guadalupensis*, which the writer reluctantly labelled it. When *N. olivacea*[14] was published, we eagerly read the description of the species and compared it with our plants. So far as we can tell from non fruiting material, this collection from Cayuga Lake represents the same plant which Rosendahl and Butters have described. Until flowering and fruiting specimens have been secured and studied, a definite opinion can not be rendered on the validity of this form in our New York flora.

The collection of J. K. & G. K. Small, no. 4385, from the shores at the mouth of the Kissimmee River, at the northern end of Lake Okeechobee, Florida, probably represents an undescribed species, allied to *N. guadalupensis*. The seeds are 1.8–2 mm. long, .8 mm. wide, and roughly and coarsely reticulate. The styles are stout, .6–1 mm. long. The leaves are .8–1 mm. wide and 1.5–2 cm. long, regularly and coarsely toothed with 15–20 teeth on each margin. It is hoped that more material of this form may be collected before any further disposition of it might be made.

Material of *N. guadalupensis* has been examined from Massachusetts, New York, Quebec, New Jersey, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Florida, Ohio, Indiana, Michigan, Illinois, Minnesota, South Dakota, Nebraska, Kansas, Missouri, Arkansas, Alabama, Louisiana, Texas, Oklahoma, Colorado,

Oregon, California, Lower California, Cuba, Haiti, Dominican Republic, Jamaica, Porto Rico, Guadaloupe, Curacao, Mexico, Guatemala, Honduras, Salvador, Nicaragua, Colombia, Venezuela, Peru, Bolivia, and Argentina.

The writer wishes to thank Dr. W. C. Muenscher for permission to study certain of his collections and for his hearty cooperation in the preparation of this paper.

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Wiley's "Ferns of Northeastern United States."[1]—It is now possible to obtain a pocket manual of ferns of the same general character as Chester Reed's little guides to the birds. Miss Farida A. Wiley of the American Museum of Natural History has put out a slender, flexibly bound volume, 4 by 6⅜ inches, designed to fit comfortably into pocket or hand-bag and, with the aid of copious illustration, brief, strictly non-technical descriptions and a carefully worked-out key to sterile fronds, to furnish an easy and painless method of naming, in the field, the species to be met with in New England and the middle Atlantic states. The little book should help the beginner toward an acquaintance with ferns; but, in view of the fact that six of the drawings are misnamed, the statement in the foreword that "by a novel method[2] . . . even the uninitiated can readily identify ferns without fear of error" seems a bit too hopeful.—C. A. W.

[1] Wiley, Farida A. Ferns of Northeastern United States. Published by the author, 1936. 98 pp., many cuts. $1.00.

[2] Wherein the novelty lies is not explained, nor is it obvious.

STUDIES IN THE TAXONOMY AND DISTRIBUTION OF THE EASTERN NORTH AMERICAN SPECIES OF LOBELIA

Rogers McVaugh

(*Continued from page 329*)

14. L. Gattingeri Gray, Proc. Am. Acad. Arts Sci. XVII: 221. 1882. Type Locality: "Middle Tennessee" (LaVergne, Rutherford Co.). Type Specimen: *Curtiss 1637* (distr. as *L. leptostachys*); in Gray Herbarium. Stem erect, 15–55 cm. high (ave. about 30 cm.), unbranched, or often with 1–6 filiform upright axillary branches, each bearing a few flowers; green, or with a brownish-red tinge near the base; nearly smooth, except for a few chaffy hairs near the base, on the angles formed by the decurrent leaf-bases. Cauline leaves 1–7, very thin in texture, practically smooth, sessile or even somewhat clasping; ovate to oblong, broadest below the middle, obtuse or the upper short-acute, irregularly sharply and finely toothed; in size to 2.0 × 4.5 cm., the upper little smaller, with an abrupt change to the bracts of the inflorescence. Basal leaves if present 1–5, obovate, obtuse, nearly smooth, narrowed at the base. Annual, acc. to Mohr (1901). Inflorescence a terminal raceme, 5–27 cm. long (ave. about 15 cm.), usually distinctly secund, bearing 15–55 (ave. about 30) flowers upon short curved pedicels (4–6 mm. long in fruit), which are nearly smooth, each with a pair of inconspicuous bracteoles near the base. Flower-bracts smooth, linear, callose-denticulate, longer than the pedicel (8–10 mm. long or less). Calyx in anthesis campanulate, smooth, becoming long-campanulate in fruit, with a smooth, inflated appearance, 3.5–4.5 mm. across by 5–6 mm. long. Capsule ⅔ or more inferior, horizontal or somewhat pendent at maturity. Calyx-lobes narrowly lance-linear, about 5 mm. long, smooth, or rarely ciliate near the tip; auricles none, or in a few cases distinct, short-triangular. Flower 10–13 mm. long (ave. 12 mm.), including calyx. Corolla light violet-blue or lilac, smooth outside, pubescent inside at the base of the lower lip. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip broad-ovate, about as long as the tube; two upper lobes shorter, lanceolate. Filament-tube 2.0–3.5 mm. long, nearly smooth, united about half its length above, somewhat deflexed. Anther-tube 1.9–2.5 mm. long, bluish-gray, the two smaller anthers slightly tufted, the three larger usually pubescent on the backs.—Springy places of calcareous bluffs; cedar barrens. Now known only from three counties in the limestone region of central Tennessee. Flower May–June. Material seen: Tennessee: davidson: Nashville, *Gattinger* (ANS, G); rutherford: Rockville, *Sudworth,* May 1897 (US); LaVergne, *Gattinger* (Curtiss 1637*) (ANS, CM, G, M, Mo, NB, US). Many herbaria have specimens from LaVergne, collected by Gattinger and distributed in various ways. The type, *Curtiss 1637*,

is presumably from LaVergne, but is labelled merely "middle Tennessee" (seen in ANS, G, M). WILSON: Lebanon, *Biltmore herb.*, Aug. 1899 (US); Lebanon, *Pennell 11384* (ANS); *11391* (ANS, UP).

15. L. FLACCIDIFOLIA Small, Bull. Torr. Bot. Club XXIV: 338. 1897. TYPE LOCALITY: Ochlockonee River Swamp, Thomasville, Thomas Co., Ga. TYPE SPECIMEN: *Small*, Jy. 12–22, 1895; in New York Botanical Garden. Stem slender, erect, simple or with several filiform branches bearing a few flowers each, 30–90 cm. high, smooth or sparsely hirsute, green, or reddish below. Leaves cauline, thin, few–15, smooth, sub-entire, with numerous obscure shallow (often crenate) callose teeth; in size 0.5–1.5 × 5–11 cm., lanceolate or long-oblong, short-acute at the tip, mostly rather abruptly narrowed at base, the lower short-petiolate. Floral bracts definitely smaller than the leaves; larger leaves well below the inflorescence. Inflorescence a loose terminal raceme, sometimes plainly secund, few–30 cm. long, bearing 3–20 flowers (when branched, the branches developing later than the main inflorescence, with 1–8 flowers each). Pedicels rough, slender, curved, 4–11 mm. long in fruit, each with a pair of conspicuous green smooth or ciliate bracteoles near the middle or below. Flower-bracts linear, smooth, denticulate, about equalling the pedicels. Calyx in anthesis short-campanulate, somewhat rough-puberulent, becoming hemispheric in fruit, strongly ribbed. Capsule more than half inferior, longer than wide, 4–6 mm. in diameter. Calyx-lobes narrowly sagittate, acute or acuminate, ciliate, usually glandular-toothed, 3–5 (7) mm. long; auricles reflexed, round, small, but conspicuous, 1 mm. or less long. Flower 14–19 mm. long (ave. 15–16 mm.), including calyx. Corolla blue, pubescent outside or smooth, the lower lip somewhat pubescent at the base, with two tubercles. Corolla-tube entire, except for the dorsal fissure, or fenestrate; lobes of the lower lip oblong or narrow-ovate, nearly as long as the tube; two upper lobes lanceolate, erect. Filament-tube 5–6 mm. long, pubescent below, connate more than half its length above. Anther-tube 2.0–2.5 mm. long, bluish-gray, the two smaller anthers tufted at the tips, the three larger pubescent on the backs.—River swamps, Coastal Plain, Georgia, northern Florida, Alabama. Flower June–September. Material seen: GEORGIA: COLQUITT: Moultrie, *Harper 1676* (Mo, NB). JOHNSON: Wrightsville, *Harper 1341* (Mo, NB); (most of these specimens are not to be distinguished from *L. Halei* Small). THOMAS: Thomasville, *Small*, Jy. 1895 (NB). FLORIDA: "Ad ripas fluv. Ocklockonne," *Rugel*, Jy. 1843 (NB). OKALOOSA: Milligan, *Curtiss 6855* (Del, M, Mo, NB, UP). ALABAMA: MOBILE: Spring Hill, *Graves 1273* (Mo).

There is some evidence to show that this species and the next are the same, and intergrade freely (cf. the plant cited above, *Harper 1341*). However, *L. flaccidifolia* differs by the thinner, more oblong leaves, greater tendency to branch, smaller and more numerous flowers, and a somewhat later flowering period; in view of these differences, it seems

best to keep them as separate species, at least until more material is seen.

16. L. Halei Small, Fl. S.E.U.S. 1145. 1903. Type Locality: "wet prairies, western Louisiana; Texas, near Houston." Type Specimen: authentic material, collected by J. Hale at Alexandria, La., and identified by Asa Gray as *L. Ludoviciana*, seen at the Gray Herbarium.—*L. Ludoviciana* Gray, Proc. Am. Acad. Arts Sci. XII: 60. 1877; not *L. Ludoviciana* Wood, Class Book 476. 1861.—Stem erect, smooth or nearly so, simple or with 1–2 stout upright branches, 30–100 cm. high, green, or reddish near the base. Cauline leaves few–20, smooth, somewhat appressed to the stem, the lower petiolate; oblanceolate, short-acute below, about 1.0 × 5–8 cm.; becoming lance-acute above; subentire or sharply toothed. Upper leaves bract-like, distant; the larger leaves well below the inflorescence. Inflorescence a terminal raceme to 35 cm. long, not noticeably secund, loosely 5–30 flowered. Pedicels rough, curved, 5–8 mm. long in fruit, each with a pair of conspicuous green smooth or ciliate bracteoles about the middle or below. Flower-bracts smoothish, linear, callose-denticulate, about as long as the pedicels. Calyx in anthesis short-campanulate or hemispheric, rough-puberulent, becoming hemispheric in fruit, strongly ribbed, about 4.5 mm. in diameter. Capsule half inferior, longer than wide. Calyx-lobes broad-sagittate, flat, acute or acuminate; smooth, at least near the tip, usually callose-denticulate, 4–6 mm. long. Auricles round, conspicuous, less than 1 mm. long. Flower 15–20 (22) mm. long, including calyx. Corolla blue, pubescent outside, the lower lip pubescent at the base inside. Corolla-tube entire except for the dorsal fissure; lobes of the lower lip ovate, short-acute, nearly as long as the tube; two upper lobes lanceolate, shorter, erect. Filament-tube 6–8 mm. long, pubescent below, connate above. Anther-tube 2.5–3.0 mm. long, light bluish-gray, the two smaller anthers densely white-tufted at tip, the three larger heavily pubescent on the backs.—Wet prairies,

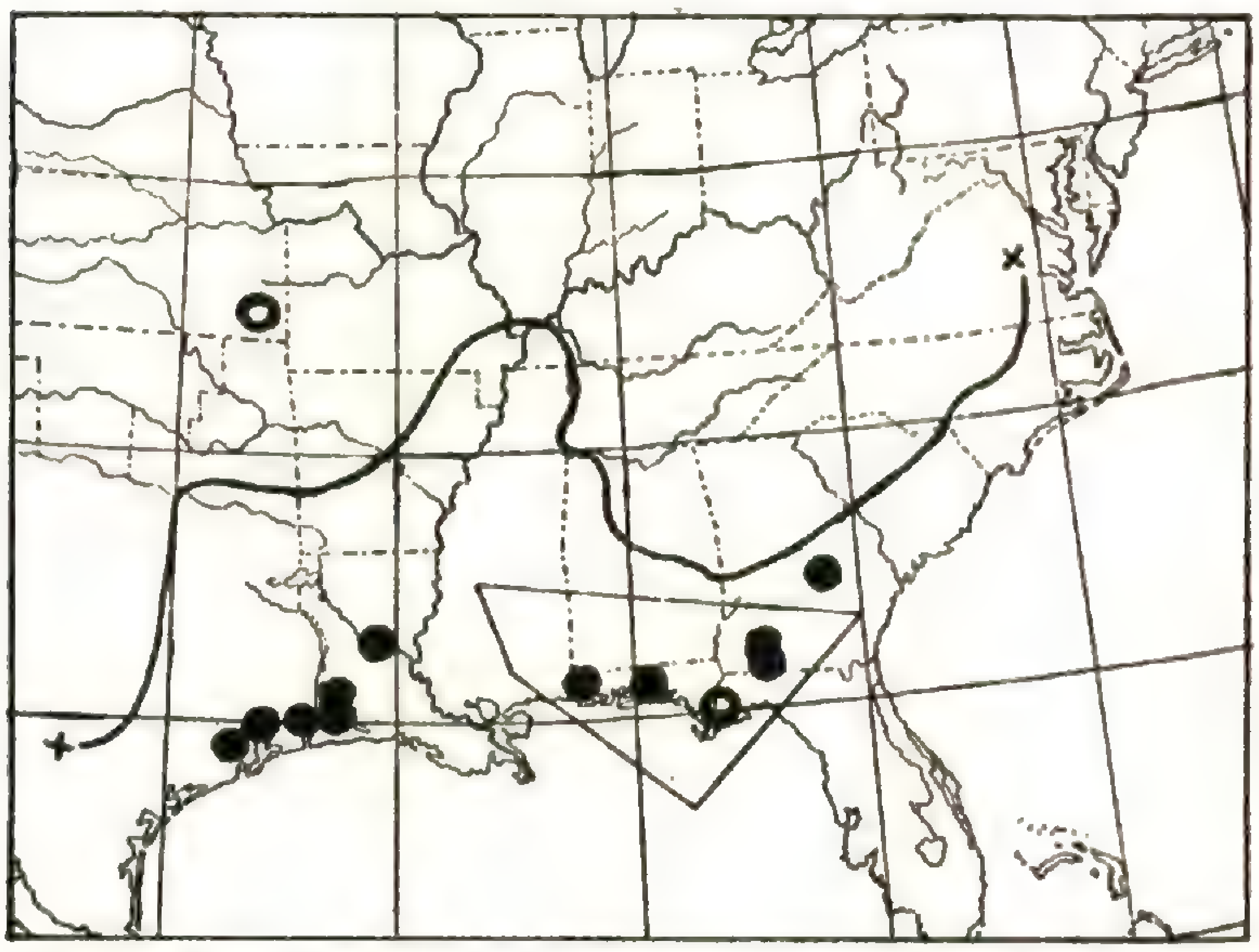

Fig. 24. Range of Lobelia Halei (unframed) and (framed) of L. flaccidifolia. Open dots represent doubtful records.

usually in sandy soil, Coastal Plain, Louisiana and eastern Texas; doubtfully north to Kansas. Flower April–July. Material seen: LOUISIANA: "Cigers Point, W. La.," *Langlois*, May 1886 (NB). CALCASIEU: Sulphur, *Palmer 7722* (NB); DeQuincy, *Pennell 10226* (UP). RAPIDES: Alexandria, *J. Hale* (ANS, G, NB). TEXAS: *F. Lindheimer, Fasc. I. 116.*, ann. 1843 (ANS). HARRIS: Houston, *Lindheimer 41* (Mo). LIBERTY; *Tharp 2506* (US). ORANGE: Orange, *Tharp 2733* (US). KANSAS: LABETTE: Parsons, *Letterman*, Jy. 1880 (Mo); this specimen is apparently *L. Halei*, but there may be some confusion as to locality.

17. L. FLORIDANA Chapman, Bot. Gaz. III: 9. Feb. 1878. TYPE LOCALITY: "Margins of ponds and swamps in the pine forests of West Florida." TYPE SPECIMEN: material from Chapman seen in the New York Botanical Garden and the United States National Herbarium.—*L. paludosa* var. *floridana* Gray, Syn. Fl. II. pt. I: Suppl. 394. 1886.—Stem erect, slender, or rather coarse in large specimens, unbranched (or often with several stout upright or spreading branches, developing later than the main axis, and bearing fewer flowers); smooth, 50–150 cm. high (ave. 80–100 cm.), green or stramineous, less often purplish at base. Leaves basal, 1–10, smooth, strap-shaped, oblanceolate or lanceolate, acute or obtuse at tip, long drawn-out at base into margined petioles; to 2.5 × 40.0 cm. (ave. about 1 × 25 cm.); more or less upright; entire or shallowly crenate, or dentate with callose teeth. Stem-leaves bract-like, 3–4, lanceolate, 2–3 cm. long, acute, distant, callose-denticulate; the lowest sometimes larger, to 0.5 × 8.0 cm. Inflorescence a terminal raceme (sometimes with secondary, shorter racemes in branched individuals), 10–50 cm. long, loosely or rather densely 10–40 flowered (ave. about 25); not secund. Pedicels stout, rough, more or less upright, 3–6 mm. long in fruit, each with a pair of inconspicuous bracteoles at the base. Flower-bracts smooth, linear, shorter than the pedicels or equalling them, inconspicuous. Calyx in anthesis flattish or conic, usually rough under a lens, becoming hemispheric in fruit (some-

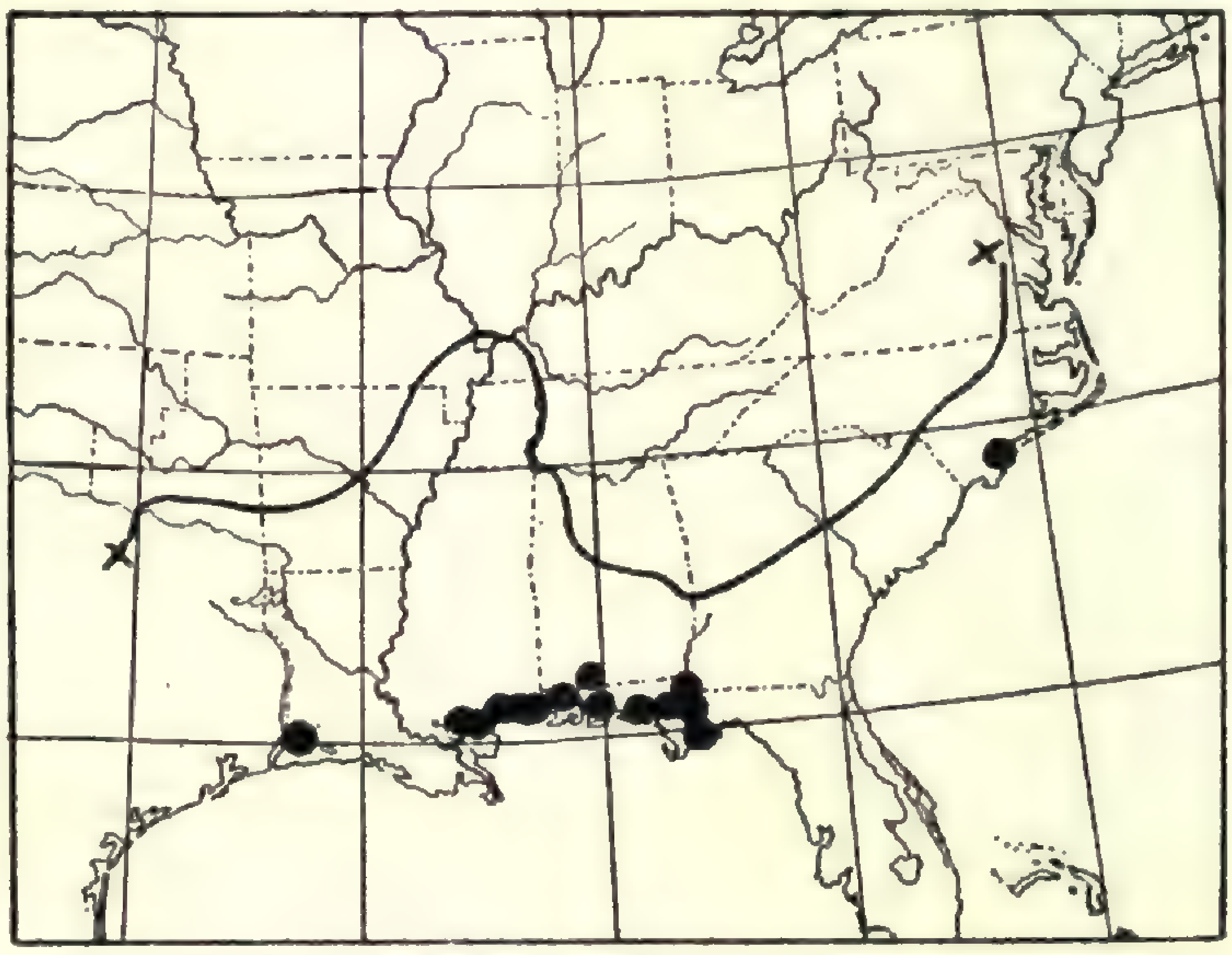

FIG. 25. Range of LOBELIA FLORIDANA.

times acute at base), about 4.0 mm. in diameter or larger. Capsule about ⅔ inferior, higher than broad. Calyx-lobes broad-lanceolate or deltoid, 2–6 mm. long, smooth, acute, usually callose-denticulate (often obscurely so). Auricles very small, triangular. Flower 13–20 mm. long (ave. 15–16 mm.), including calyx. Corolla blue, usually pubescent outside, the lower lip densely hirsute-pubescent at base inside. Corolla-tube entire except for the dorsal fissure (rarely fenestrate); lobes of the lower lip ovate, short-acute, reflexed, shorter than the tube; two upper lobes lanceolate, erect. Filament-tube 6–11 mm. long (ave. 7.5–9.0 mm.), strongly deflexed, pubescent below, connate more than half its length above. Anther-tube about 3.0 mm. long, light bluish-gray, the two smaller anthers tufted at the tips, the three larger merely pubescent on the backs.—Moist pinelands and borders of pineland and cypress ponds, often partially immersed; western Louisiana to north-western Florida and eastern North Carolina; near the coast. Flower May to August and September. Material seen: North Carolina: new hanover: Wilmington, *MacFarlane*, Jun. 1909 (UP). Florida: franklin: Apalachicola, *Chapman*, Biltmore herb. 4164a (NB, US). jackson: (probably Fla.); *Chapman*, Aug. 1838 (Torrey herb., NB). liberty: *Biltmore herb.*, Aug. 1901 (US). santa rosa: Milton, *Harper 45* (G, NB, US). walton: Point Washington, *Biltmore herb.*, Aug. 1891 (US). washington: Chipley, *Curtiss 6851* (Del, M, NB, US). Alabama: escambia: Flomaton, *Biltmore herb. 4164c* (US). mobile: Mobile, *Mohr* (US). Mississippi: hancock: Bay St. Louis, *Dr. Ingalls*, Torrey herb. (NB). harrison: Biloxi, *Tracy 4942* (Mo). jackson: Ocean Springs, *Pollard 1058* (NB, US). Louisiana: calcasieu: Lake Charles, *Allison 283* (NB, US). st. tammany: Covington, *Bro. Arsene 11883* (NB, US).

18. L. paludosa Nuttall, Gen. N. Am. Pl. II: 75. 1818. Type Locality: "In deep sphagnose swamps, from Sussex county in Delaware to Georgia." Type Specimen: authentic material in the Academy of Natural Sciences of Philadelphia. *L. pallida* Elliott, Sk. Bot. S. C. & Ga. I: 265. 1821 (in part). *L. nudicaulis* Rafinesque, Atl. Journ. I: 147. 1832.—In habit and vegetative characters hardly separable from *L. floridana*, but smaller; stem 20–135 cm. high (ave. 50–60 cm.); less freely branched; often purplish at base and at bases of leaves. Leaves basal, smaller, shorter (ave. size about 1 × 12 cm.), usually oblanceolate, short-acute (rarely with an ovate blade and a short petiole). Stem-bracts 1.0–2.5 cm. long (rarely 5.0 cm.). Inflorescence 2–35 cm. high (ave. about 15 cm.), loosely few–30 flowered (ave. about 15). Pedicels rough, not stiffly upright, rather slender, 5–9 mm. long in fruit, with no bracteoles visible under a lens. Flower-bracts shorter than the pedicels, linear. Calyx in anthesis conic, rough, becoming hemispheric in fruit, sometimes acute at base, 3.5–4.0 mm. in diameter. Capsule about ⅔ inferior, higher than broad. Calyx-lobes lanceolate or deltoid, acute, smooth, entire or callose-denticulate, about 3.0 mm. long. Auricles none or very small. Flower

11–16 mm. long, including calyx (ave. 12–13 mm.). Corolla light blue or nearly white, practically smooth outside, the lower lip densely hirsute-pubescent at base inside. Corolla-tube fenestrate; lobes of the lower lip ovate, little shorter than the tube, scarcely reflexed; two upper lobes lanceolate. Filament-tube 3.0–4.5 mm. long (ave. 3.5 mm.), hairy below, connate about half its length above, somewhat deflexed. Anther-tube 2–3 mm. long, light bluish-gray, the two smaller anthers tufted at tips, the three larger merely pubescent on the backs.

This species seems wholly distinct from the larger *L. floridana.* It may be distinguished by the shorter filament-tube, generally smaller size and smaller corolla; the fenestrate corolla; the absence of bracteoles on the pedicel.—Swamps and low pinelands and ponds, often partially immersed; southern Georgia and throughout peninsular Florida; reported (perhaps always upon the authority of Nuttall) from Delaware; the report may be based upon *L. Boykinii* T. & G., which occurs there. Flower February–May, or more or less throughout the year. Representative material seen: GEORGIA: CAMDEN: St. Marys, "*Bal.,*" Schweinitz herb. (ANS). CHARLTON: Traders Hill, *Small,* Jun. 1895 (NB). FLORIDA: ALACHUA: Gainesville, *Crawford,* Apr. 1897 (ANS, Duke). BREVARD: "Indian River," *Palmer,* ann. 1874 (US). BROWARD: Ft. Lauderdale, *Meredith,* Mar. 1917 (ANS). CLAY: Hibernia, *Canby,* Mar. 1869 (ANS, NB, US). DADE: Miami, *Small 3261* (NB). DUVAL: Jacksonville, *Curtiss 4715* (Del, M, NB, NYS, US). FRANKLIN: Apalachicola, *Chapman,* Biltmore herb. 2679b (NB, US). GULF: Wewahitchka, *Leeds,* Apr. 1933 (ANS). HILLSBOROUGH: Tampa, *Garber,* May 1876 (NB, US). INDIAN RIVER: Fellsmere, *Small 8912* (NB). LAKE: Eustis, *Nash 501* (ANS, Del, M, NB, US). LEE: Ft. Myers, *Miss Standley 40* (ANS, CM, NB, US). LEON (or WAKULLA): "inter Tallahassee & St. Marks," *Rugel,* May 1843 (NB). LEVY: Bronson, *J. D. Smith,* Apr. 1880 (US). MANATEE: Bradentown, *Tracy 6864* (NB, US). OSCEOLA: Kissimmee Prairie, *Mearns,* Apr. 1901 (US). PALM BEACH: "Ft. Lauderdale to Lake Okeechobee," *Small 4111* (NB). PINELLAS: St. Petersburg, *Williams,* Apr. 1926 (ANS). POLK: *J. D. Smith,* Apr. 1880 (US). PUTNAM: Palatka, *Williamson,* Apr. 1894 (ANS). ST. JOHNS: St. Augustine, *Reynolds,*

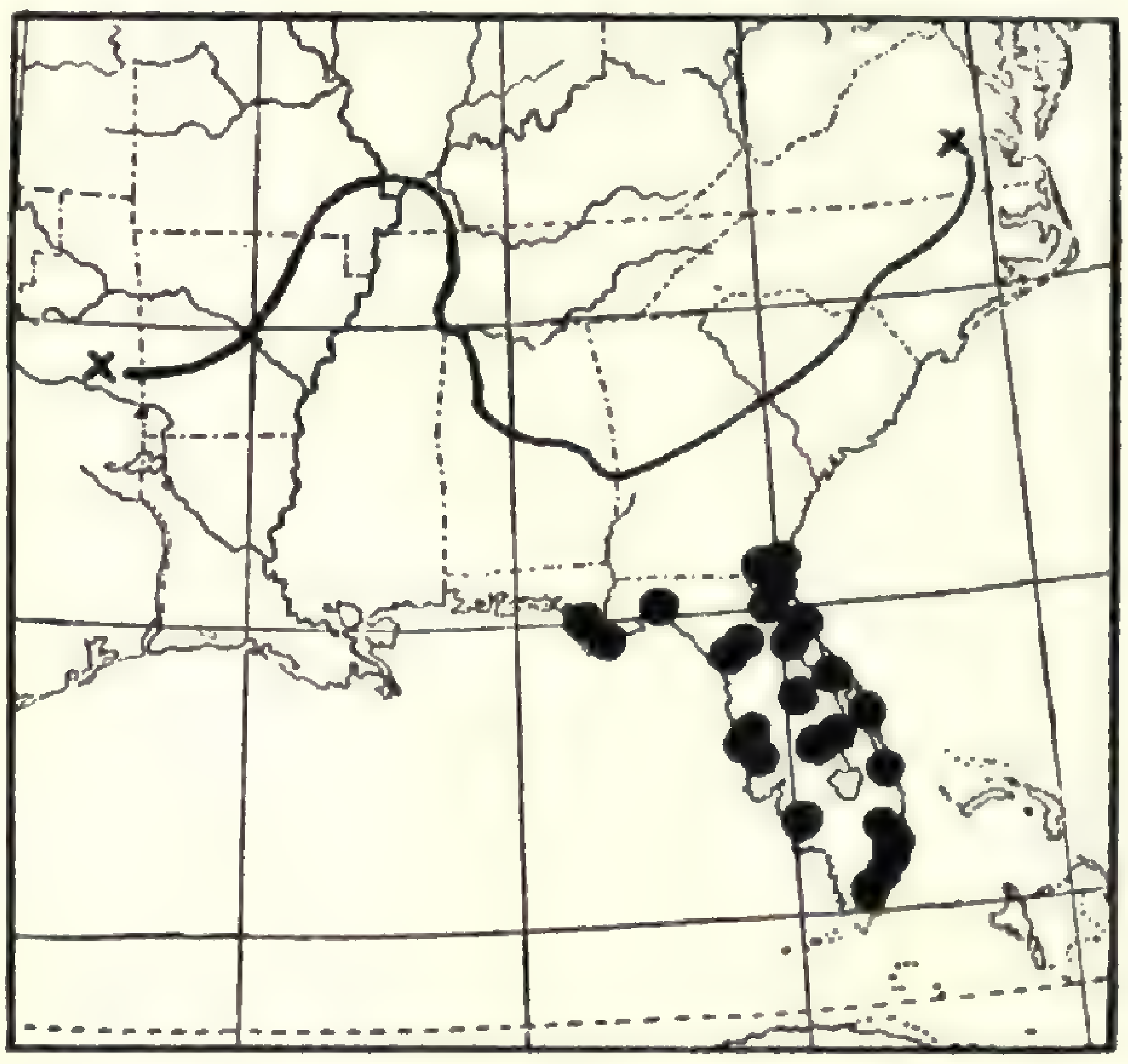

FIG. 26. Range of LOBELIA PALUDOSA.

May 1876 (Del, NB). SARASOTA: Sarasota, *Leeds*, Apr. 1931 (ANS). VOLUSIA: Lake Helen, *Mrs. Deam 1787* (M).

19. L. Nuttalli Roem. & Schult., Syst. Veg. V: 39. 1819. Type Locality: "On the dry margins of sandy swamps, from New Jersey to Carolina." Type Specimen: authentic material of "*L. gracilis*" in the Academy of Natural Sciences of Philadelphia.—Perhaps the "*Rapuntium minimum flore pallide coeruleo: caulibus tenuibus infirmis*" of Gronovius, Fl. Virg. 134. ed. II. 1762. *L. Kalmii* Walter, Fl. Car. 218. 1788. *L. Kalmii*, var. *Caroliniana*, Michaux, Fl. Bor.-Am. II: 153. 1803. *L. gracilis* Nuttall, Gen. N. Am. Pl. II: 77. 1818. not *L. gracilis* Andrews, Bot. Rep. V: 340. 1803, which is an Old World species. *L. Kalmii*, var. *gracilis*, Barton, Fl. N. Am. I: plate 34. 1821.—Stem slender, erect, 20–75 cm. high, sometimes simple, but usually with one–several filiform racemose upright or spreading branches; smooth and green above, usually dark purplish-red and short-puberulent below. Cauline leaves few–20, smooth, rather thin, oblanceolate or ovate below, the upper lanceolate or linear; short-acute, or the lower obtuse; sub-entire in outline, but with shallow callose teeth; an average leaf about six times as long as wide; often 0.5 × 2.5 cm. (rarely 1.1 × 2.5–4.0 cm.). Basal leaves ovate, petiolate, more or less pubescent, to 1.0 × 1.5 cm. Petiole to 1 cm. long. Inflorescence a terminal raceme (in branched individuals a main raceme with several shorter secondary ones, developing later in the season); sometimes plainly secund, loosely few–20 flowered. Pedicels slender, flexuous, more or less upright, smooth or often prickly, 5–11 mm. long in fruit, each with a pair of bracteoles at the base. Flower-bracts equalling the pedicels or short (then 1–2 mm. long), smooth, nearly linear, somewhat denticulate. Calyx in anthesis flattish; often with few–numerous bristly hairs, sometimes smooth; becoming short-hemispheric in fruit, about 3.0 mm. in diameter. Capsule about half inferior. Calyx-lobes smooth, entire, narrow-lanceolate or deltoid, 2.0–3.5 mm. long. Auricles none. Flower 8–11 mm.

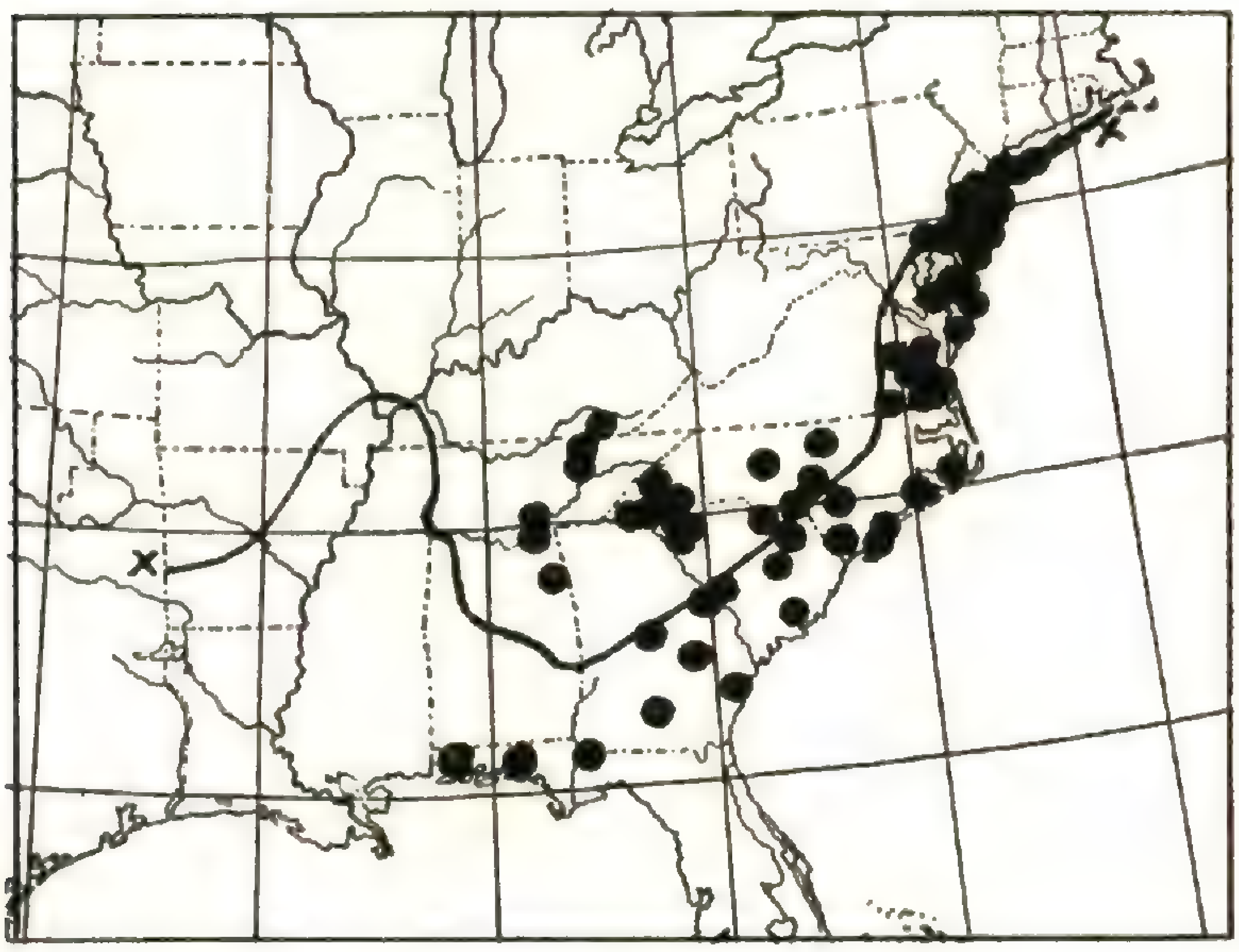

Fig. 27. Range of Lobelia Nuttalli.

long, including calyx. Corolla blue, with a white eye and two greenish tubercles at the base of the lower lip; smooth, or hairy inside the tube. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip narrow-ovate, shorter than the tube; two upper lobes lanceolate, curved upward. Filament-tube about 3.0 mm. long, pubescent below, connate more than half its length above. Anther-tube about 1.5 mm. long (1.0–1.8 mm.), bluish-gray, the two smaller anthers tufted at the tips, the three larger smooth or pubescent on the backs. Open sandy or grassy swamps, or woods, sometimes in brackish marshes, or dry sandy places; usually in acid situations; central Tennessee and Kentucky to Alabama (Mississippi, acc. to Small), Florida, north to southern Long Island. Appalachian Provinces and Coastal Plain; in Pennsylvania and New York confined to the Coastal Plain and the region south of the moraine. Flower July 1–September 1, from N. J. northward; fruit July 20–October. Southward flowering earlier, beginning May 20. Representative material seen: KENTUCKY: LAUREL: Sandy Swamps, *Braun*, Oct. 1933 (G); MC CREARY: Pine Knot, *Pennell 13899* (ANS). TENNESSEE: FRANKLIN: Sewanee, *E. K. Smith*, ann. 1881 (W). MORGAN: Huffmans, *Pennell 13937* (ANS, UP). SCOTT: Winfield, *Pennell 13926* (ANS). ALABAMA: BALDWIN: Perdido, *Mohr*, Jun. 1890 (US). CHEROKEE: Round Mt., *Leeds*, Jun. 1934 (ANS). CULLMAN: Cullman, *Eggert*, Sep. 1897 (CM, US). ETOWAH: Ballplay, *Mohr*, Jy. 1890 (US). JACKSON: Flat Rock, *Wherry*, Jun. 1933 (ANS, UP). JEFFERSON: DeSoto Falls, *Ruth*, Jy. 1898 (NB, O, US). FLORIDA: GADSDEN: Quincy, *Chapman* (ANS). WALTON: DeFuniak Springs, *Curtiss 5902* (Del, M, NB, NYS, US). GEORGIA: BALDWIN: "*Dr. Boykin*, Ga.," Torrey herb. (NB). EMANUEL: Graymont, *Harper 814* (NB, US). IRWIN: Ocilla, *Harper 1418* (NB, US). LIBERTY: Sunbury, *L. LeConte* (NB). RICHMOND: Augusta, *Cuthbert*, Jun. 1900 (NB). SOUTH CAROLINA: AIKEN: Aiken, *Ravenel*, Aug. 1866 (NB). ANDERSON: Anderson, *Davis 8214* (US). DARLINGTON: Hartsville, *Norton*, Jy. 1920 (NYS, US). DORCHESTER: Summerville, *Brownfield* (US). GREENVILLE: Reedy River, *J. D. Smith*, Jy. 1881 (US). LANCASTER: Elgin, *House 2571* (US). PICKENS: Table Mt., *Small*, Aug. 1896 (NB). RICHLAND: Columbia, *Taylor* Jun. 1891 (M). SUMTER: Cane Savanna, *Stone 424* (ANS). NORTH CAROLINA: ANSON: Wadesboro, *Leeds*, Jy. 1929 (ANS). BRUNSWICK: Southport, *Blomquist 5027* (Duke). COLUMBUS: Hallsboro, *Wherry*, Sep. 1934 (UP). CRAVEN: New Bern, *Loomis and Croom* (ANS). CUMBERLAND: Fayetteville, *Biltmore herb. 624k* (NB). DURHAM: *Blomquist 5029* (Duke). HAYWOOD: Waynesville, *Huger* (NB). HENDERSON: Hendersonville, *Biltmore 624a* (NB, US). HYDE: Scranton, *Ashe*, Jun. 1898 (NC). IREDELL: Statesville, *Hyams* (M). JACKSON: Cashiers, *Pennell 14178* (ANS). JOHNSTON: Clayton, *Blomquist 5026* (Duke). MACON: Highlands, *Cuthbert*, Jy. 1897 (NB). MOORE: Pinehurst, *Wicker*, Sep. 1931 (NC). NEW HANOVER: Wilmington, *Coville 71* (US). ORANGE: Chapel Hill, *Totten*, Jun. 1915 (NC). PENDER:

Burgaw, *Hyams*, Aug. 1879 (US). ROWAN: Salisbury, *Heller 106* (ANS, NB). STANLEY: Falls of Yadkin, *Small and Heller*, Aug. 1891 (ANS). TRANSYLVANIA: Cedar Mountain, *Wherry*, Sep. 1934 (UP). VIRGINIA: ACCOMAC: Franklin City, Brown, Sep. 1907 (ANS). ELIZABETH CITY: Hampton, *Steele*, Aug. 1895 (US). GLOUCESTER: Ark, *Leonard and Killip 562* (ANS, US). GREENVILLE: "Belfield," *Heller*, Jun. 1893 (ANS, UP, US). HENRICO: Richmond, *Carter*, Sep. 1894 (ANS). JAMES CITY: Ewell, *Grimes 3901* (NB). NANSEMOND: Suffolk, *Kearney 1576* (US). NORFOLK: *Curtiss*, Jun. 1872 (NB). PRINCE GEORGE: New Bohemia, *Pennell 14425* (ANS). PRINCESS ANNE: Virginia Beach, *Britton et al.*, Jy. 1892 (NB). MARYLAND: HARFORD: Magnolia, *Carter*, Aug. 1904 (ANS). WICOMICO: Sharptown, *J. P. Otis* (?) *C1346* (herb. R.R.T.). WORCESTER: Ocean City, *Canby*, Jy. 1893 (Del). DELAWARE: NEWCASTLE: *Canby*, Aug. 1890 (Del). SUSSEX: Ellendale, *Tatnall 193* (herb. R.R.T.). PENNSYLVANIA: BUCKS: Yardley, *Dreisbach 3260* (ANS). DELAWARE: Tinicum Island, *A. H. Smith*, Jy. 1864 (UP). NEW JERSEY: ATLANTIC: Mays Landing, *Pennell 8117* (ANS). BURLINGTON: Atsion, *Long 6188* (ANS). CAMDEN: Lindenwold, *Long 26393* (ANS); CAPE MAY: Cold Spring, *Stone 13453* (ANS). CUMBERLAND: Dividing Creek, *Long 4808* (ANS). GLOUCESTER: Hardingville, *Long 32545* (ANS). MERCER: Bear Swamp, *Bartram*, Jy. 1913 (ANS). MIDDLESEX: Milltown, *Mackenzie 2803* (US). MONMOUTH: Farmingdale, *Stone 12706* (ANS). OCEAN: Lakehurst, *Long 16613* (ANS). SALEM: Auburn, *Tatnall*, Aug. 1927 (herb. R.R.T.). NEW YORK: NASSAU: Oceanside, *House* Jy. 1916 (NYS). QUEENS: Lawrence Sta., *Bisky*, Aug. 1886 (NB). SUFFOLK: Central Islip, *Ferguson*, Jy. 1920 (NYS).

20. L. FEAYANA Gray, Proc. Am. Acad. Arts Sci. XII: 60. 1877. TYPE LOCALITY: "Eastern and Southern Florida." TYPE SPECIMEN: Material cited by Gray (l. c.) seen in the Gray Herbarium.—Not *L. aphylla* Nuttall, Am. Jour. Sci. V: 297. 1822, which is not a *Lobelia;* see Nuttall in Jour. Acad. Phila. VII: 61–62. 1834. Perhaps *L. microphylla* Rafinesque, Atl. Jour. I: 147. 1832. The latter is described as follows: "Stem simple smooth, leaves minute remote ovate sessile dentate, flowers terminal few and small. Florida and Louisiana."—Stem weak, slender, decumbent or ascending, 5–30 cm. long, simple or diffusely branched, usually near the base; green, rarely purplish below, smooth, sometimes trailing and rooting at nodes. Cauline leaves 1–10, smooth, lanceolate or lance-ovate above, acute, denticulate, about 2.5×8.0 mm. Lower leaves broad-ovate or orbicular, 8–13 mm. in diameter, with a definite petiole sometimes 2.0 cm. long; entire or crenate-toothed. Basal leaves similar to the lower cauline ones. Rootstock slender, trailing. Inflorescence a lax terminal raceme 2–18 cm. long (often half the length of the entire plant), more or less secund, bearing 2–15 rather distant flowers upon smooth slender pedicels which are 4–7 mm. long in fruit, each with a pair of inconspicuous bracteoles near the base. Flower-bracts small,

inconspicuous, 1–3 mm. long, acute. Calyx in anthesis conic or short-campanulate, smooth, becoming turbinate in fruit, usually acute at the base, averaging 2.5 mm. in diameter, by about 3.5 mm. high. Capsule ⅔ or more inferior. Calyx-lobes narrowly lanceolate, smooth, entire, 2.0 mm. long. Auricles none. Flower 7–10 mm. long, including calyx. Corolla blue, with a white eye, and two greenish tubercles at the base of the lower lip; smooth, or the tube hairy inside. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip narrow-ovate, shorter than the tube; two upper lobes lanceolate, curved upward. Filament-tube about 3.0 mm. long, nearly smooth, connate more than half its length above, deflexed. Anther-tube 1.0–1.5 mm. long, bluish-gray, the two smaller anthers tufted at the tips, the three larger smooth or pubescent on the backs. Seeds rough-reticulate, ovate, about 0.5 mm. long.

This species is very close to *L. Nuttalli*, from which it differs by the weaker shorter stems, usually roundish lower leaves, general smoothness, including pedicels and calyx (in contrast to *L. Nuttalli*, which is often prickly), and the more elongate calyx. It is apparently not at all closely related to *L. Cliffortiana* L. and its relatives, as has been supposed by most American authors, but is in a wholly different section of the genus. It is, however, superficially like the plant passing for *L. Xalapensis* HBK. (*L. Cliffortiana* var. *Xalapensis* Gray), which may be distinguished by the *smooth shining seeds*, more upright, coarser leafy stems, longer inflorescence, serrate leaves.—Moist places, ditches, seashores, swamps, often in sandy places and pinelands; peninsular Florida; not seen from extreme southern Florida. Flower January–June, or more or less throughout the year. Representative material seen: FLORIDA: BREVARD: Cape Canaveral, *Curtiss 5831* (Del, M, NB, NYS). CHARLOTTE: Punta Gorda, *Leeds*, Apr. 1931 (ANS). DUVAL: Pablo, *Lighthipe 539* (M, NB, W). GLADES: Palmdale, *Leeds*, Apr. 1931 (ANS). HIGHLANDS: Sebring, Mar. 1935 (UP). HILLSBOROUGH: Tampa, *Churchill*, Mar. 1923 (ANS). INDIAN RIVER: Fellsmere, *Small 8891* (NB). LAKE: Lakeland, *Blanton 6971* (NB). LEE: Coconut, *Moldenke 695* (Duke, NB, UP). MANATEE: Bradentown, *Tracy 7510* (CM, M, UP, W). PINELLAS: St. Petersburg, *Mrs. Deam 5000* (M). ST. LUCIE: Fort Pierce, *Tatnall 864* (ANS). SARASOTA: Osprey, *B. H. Smith*, Mar. 1904 (ANS, CM). SEMINOLE: Sanford, *S.R.*, Apr. 1915 (NB). VOLUSIA: Mosquito Inlet, *Curtiss 1641** (CM, M, NB, UP).

FIG. 28. Range of LOBELIA FEAYANA.

21. L. KALMII Linnaeus, Spec. Pl. II: 930. 1753. TYPE LOCALITY: "Habitat in Canada." TYPE SPECIMEN: in the Linnaean herbarium

in London; collected by Kalm, and seen by Linnaeus before 1753. Photograph seen.—*Rapuntium Canadense, pumilum, Linariae folio Sarrac.*, Tournefort, Inst. R.H. 164. 1719. This is apparently the first mention in literature of this plant. The material was sent to Tournefort by Dr. Michel Sarrazin (1659-ca. 1736), who was at that time a physician in Quebec. *L. falcata* Rafinesque, N. Fl. N. Am. II: 18. 1836. *L. Kalmii* var. *strictiflora* Rydberg, Fl. Montana 378. 1900. Type Locality: "Rocky Mountain Region." Type Specimen: Teton R., Mont., *Scribner 130* (seen in ANS, Del, O); also Hurricane Hills, Assiniboia, *Macoun*, ann. 1883. The variety is said to differ from the typical form by the erect pedicels and the acute base of the capsules. However, these characters do not hold entirely, even in the type material (*Scribner 130*); moreover, the present writer has seen material from Montana and the mountains of British Columbia which exactly duplicates eastern material. It is thus thought best not to recognize the variety. *L. strictiflora* Lunell, Bull. Leeds Herb. No. 2: 8. Nov. 3, 1908.—Plants extremely variable in vegetative characters. Stems tall, slender, nearly unbranched, 15–35 (60) cm. high, green or reddish below, smooth or slightly pubescent near the base; varying to a diffusely branched form which is often stouter and shorter, and sometimes to a tufted form with stems 2–3 cm. high, forming a rosette-like mat. Cauline leaves 4–15, smooth, thin, subentire or shallowly dentate, with callose teeth; narrowly linear or lance-linear (in the unbranched form), 0.05–0.2 × 0.7–4.0 cm. In the branched or coarser plant; leaves broader, larger, 0.08–0.8 × 0.7–7.0 cm., oblanceolate or broader, even to narrow-ovate, usually obtuse, the lower sometimes narrowed into short petioles. Basal leaves if present few, spatulate or obovate, obtuse, petiolate, somewhat pubescent, often purplish, about 0.5 × 1.5 cm. (Maximum 0.8 × 3.5 cm.). Rootstock slender, sometimes elongate. Main inflorescence a loose terminal raceme, sometimes plainly secund, bearing 1–15 flowers upon long slender roughened pedicels (8–18 mm. long in fruit), each with a pair of conspicuous sub-opposite bracteoles near the middle. Pedicels loose, flexuous or stiffly appressed. Branch-racemes shorter than the central one, and developing later. Flower-bracts linear, smooth, about equalling the pedicel or longer (in the more luxuriant, branched plants). Calyx in anthesis conic or campanulate, smooth, becoming long-oval, oblong, or sub-globose in fruit, varying with age on the same plant (usually rounder when young). Capsule more than ¾ inferior, 3–6 mm. in diameter, by 4–9 mm. long. Calyx-lobes lanceolate or deltoid, 1.5–5.0 mm. long (ave. 2.5–3.5 mm.), smooth. Auricles none. Flower 7–16 mm. long, including calyx (ave. 10–13 mm.). Corolla blue, with a conspicuous white eye, or sometimes all white; smooth, or the tube hairy inside, the lower lip smooth. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate, apiculate, equalling or exceeding the tube; two upper lobes lanceolate, curved upward. Filament-

tube 2.5–3.5 mm. long, smooth, connate above more than half its length. Anther-tube 1.6–1.8 (2.0) mm. long, bluish-gray, the two smaller anthers tufted, the three larger smooth or pubescent on the backs. Seeds long-fusiform, acute at both ends, 0.6–0.8 mm. long.

The diversity of form shown by this plant seems to be related to changes in habitat; it is a plant of calcareous situations, in general, and the slender, unbranched form is characteristic of grassy or marly bogs, while the coarser or more luxuriant form is known more from limy beaches or cliffs. All efforts to separate them by good characters, independent of habitat, have failed.—Wet meadows and bogs, in neutral or calcareous situations; shale or limestone beaches or cliffs;

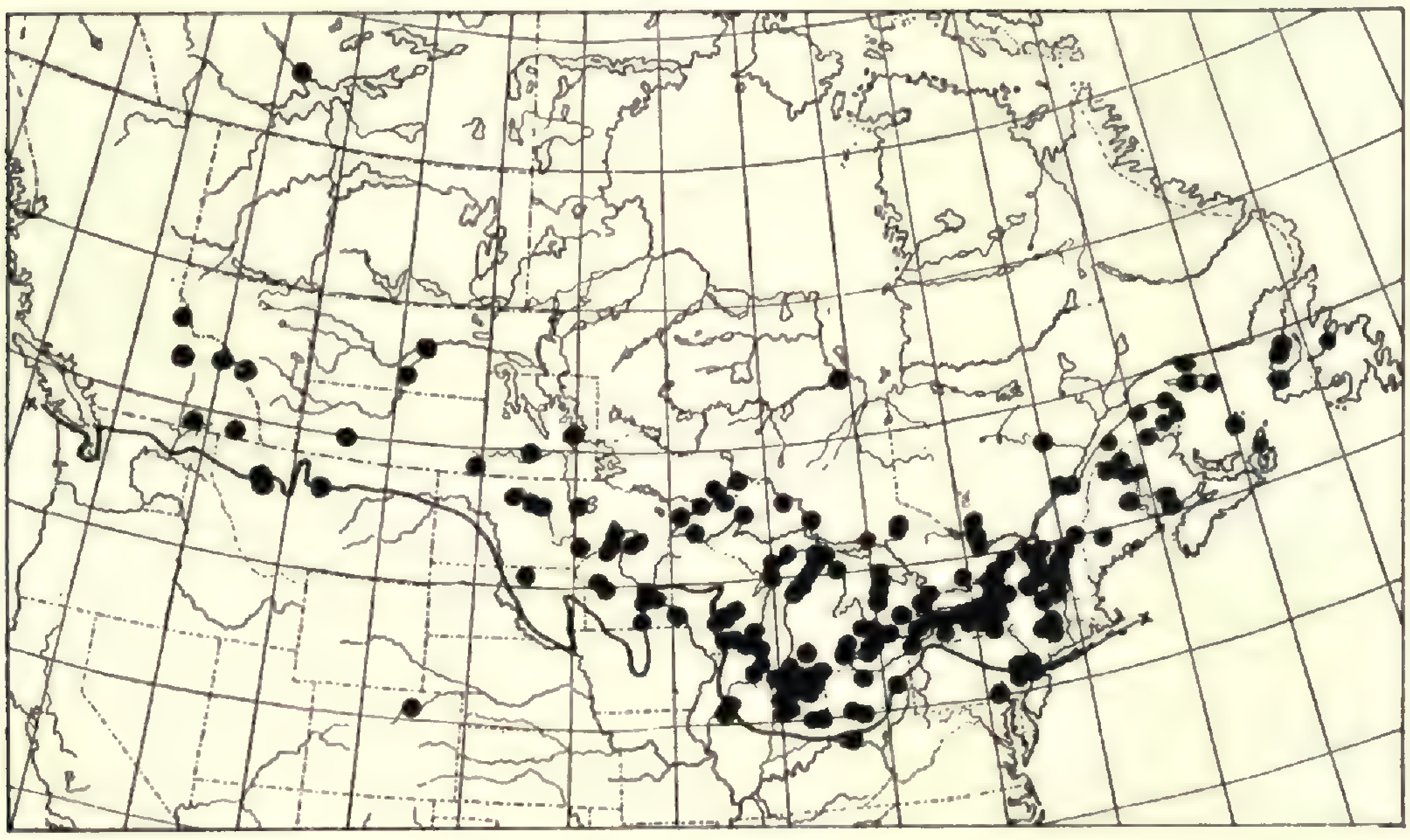

Fig. 29. Range of Lobelia Kalmii.

sometimes in sandy bogs; almost always in wet places. Newfoundland to western Massachusetts and south to the moraine in Pennsylvania (also Lancaster Co.); west to Ohio, Minnesota, and Colorado, north to Hudson Bay, Montana, British Columbia and Great Slave Lake. Absent from large regions of prevailingly acid soil. Flower July 1–September 1. Fruit July 20–September 20. So characteristic that it is unnecessary to cite the abundant material seen, except for the following outlying stations. Pennsylvania: lancaster: Dillerville Swamp, *Heller*, Sept. 1901 (CCD, CU, W). Ontario: cochrane: James Bay, mouth of Albany River, *Spreadborough*, herb. G. S. Can 62542(O). Mackenzie: sandy muskeag, N. arm, Great Slave Lake, *G. S. Hume*, Jy 31, 1920(O). Colorado: larimer: Fort Collins, *Baker*, Aug. 1896 (CM).

22. L. Dortmanna Linnaeus, Spec. Pl. II: 929. 1753. Type Locality: "Habitat in Europae frigidissimae lacubus & ripis."

Type Specimen: in Linnaean Herbarium in London; seen by Linnaeus before 1753. Photograph seen.—*Gladiolus lacustris Dortmanni*, Clusius, "Curae posteriores," 40. 1611. *Leucoium palustre flore subcaeruleo*, Bauhin, "Pinax," 202. 1623. *Dortmanna lacustris floribus sparsis pendulis*, Rudbeck, Act. ups. 1720. p. 97. t. 2 (according to Linnaeus). *L. foliis bilocularibus subulatis*, Linnaeus, Fl. lapp. 227. 1737.—Aquatic; smooth throughout. Stem upright, unbranched (rarely with 1–2 branches), 5–100 cm. high (ave. 30–35 cm.), usually immersed about ⅔ of its height (all except the inflorescence); green above water, and green to stramineous below, leafless, bearing 0–7 linear fleshy bracts 1–7 mm. long; stem hollow. Leaves basal (rarely developing 1–3 cauline leaves 2–4 cm. long), linear, entire, fleshy, in number 2–27 (ave. 15–20), 2.0–5.0 (8.0) cm. long by 1.0–4.0 mm. wide, when flattened out; obtuse or short-acute. Inflorescence a lax terminal raceme to 45 cm. long (ave. 10–20 cm.),

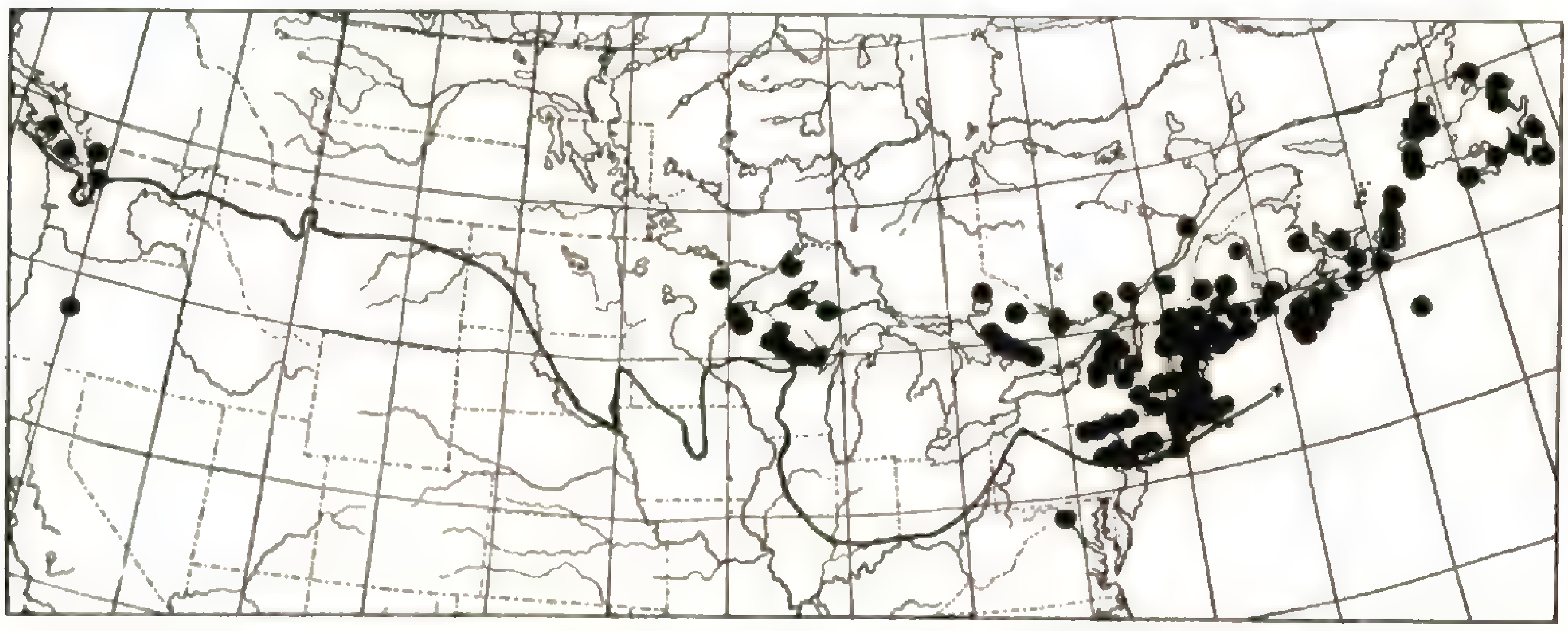

Fig. 30. American Range of Lobelia Dortmanna.

often more or less secund, very loosely 1–11 flowered (ave. 5–6). Pedicels in fruit 4–13 mm. long (ave. about 7.0 mm.), curved, elongating in fruit and curving further, so that the flower is often horizontal, while the fruit is pendent. Bracteoles of pedicel none. Flower-bracts obtuse, fleshy, entire, 2–3 mm. long, with a broad base. Calyx in anthesis conic or long-triangular, becoming long-cylindric, barrel-shaped or obconic in fruit, usually with a long-attenuate base, in size 4–5 × 6–12 mm. Capsule ¾ or more inferior. Calyx-lobes short-lanceolate or deltoid, blunt, 1.5–2.5 mm. long. Auricles none. Flower 12–22 mm. long, including calyx (N.B. In this species the length of the flower is very variable, with the youngest flowers of a well-developed inflorescence often appearing the smallest. This tendency is seen throughout the group, but not so strikingly as in *L. Dortmanna*.). Corolla pale violet-blue to white, pubescent at the base of the lower lip, otherwise smooth. Corolla-tube entire except for the dorsal fissure, which may extend only to within 1–2 mm. of the base. Lobes of the lower lip long-ovate, nearly equalling the tube,

not sharply reflexed; two upper lobes linear, curved upward. Filament-tube 4–6 mm. long (ave. about 4.5), pubescent below, connate most of its length above. Anther-tube 1.3–1.7 mm. long, dark gray or black, the two smaller anthers heavily tufted, the three larger densely bearded, especially near the tip. Seeds dark brown, with a prominent square base at one end.—Sandy or gravelly borders of ponds, usually partly immersed; more rarely in mud or in quiet streams; Newfoundland and central Ontario to northern Pennsylvania, west to northern Minnesota; also in Oregon, Washington and British Columbia; Slave Lake, *Richardson* (Hooker, Fl. Bor.-Am.). Apparently identical with the plant of northwestern Europe. Flower July 1–September 1. Fruit July 15–September 15. So distinct that it is unnecessary to cite the specimens seen, except from the following outlying localities. West Virginia: A specimen in the Detwiller herbarium in the Academy of Natural Sciences of Philadelphia is labelled: "nr. Harpers Ferry, Virg. Aug. 14, 1846." The Detwiller herbarium is mostly from near Mercersburg, Pa., and it is possible that the above collection is from Pennsylvania or even further north. Oregon: jefferson: Cascade Mts., Dark Lake, *Sweetser*, Aug. 1926 (ANS).

Explanation of Abbreviations for Herbaria

Ab = University of Michigan, Ann Arbor, Mich.; ANS = Academy of Natural Sciences, Philadelphia, Penna.; CCD = Herbarium of Chas. C. Deam, Bluffton, Indiana; CM = Carnegie Museum, Pittsburgh, Penna.; CU = Cornell University, Ithaca, New York; Del = Delaware Society of Natural History, Wilmington, Del.; Duke = Duke University, Durham, N. C.; G = Gray Herbarium, Harvard University, Cambridge, Mass.; herb. R.R.T. = Herbarium of R. R. Tatnall, 1100 W. 10th St., Wilmington, Del.; M = University of Minnesota, Minneapolis, Minn.; Miss = Mississippi State College, State College, Miss.; Mo = Missouri Botanical Garden, St. Louis, Mo.; NB = New York Botanical Garden, Bronx Park, N. Y.; NC = University of North Carolina, Chapel Hill, N. C.; NE = New England Botanical Club, Gray Herbarium, Harvard Univ.; NYS = Herbarium of New York State Museum, Albany, N. Y.; O = National Museum of Canada, Ottawa, Ont.; Pa = Pennsylvania State Herbarium, Harrisburg, Penna.; R = Rocky Mountain Herbarium, Univ. of Wyoming, Laramie, Wyo.; Toronto = Toronto University, Toronto, Ont.; UGa = University of Georgia, Athens, Ga.; UP = University of Pennsylvania, Philadelphia, Penna.; US = U. S. National Museum, Smithsonian Institution, Washington, D. C., W = University of Wisconsin, Madison, Wis.; WVa = West Virginia University, Morgantown, W. Va.

Explanation of plate 435

Fig. 1, L. Cliffortiana L. (possibly *L. xalapensis* HBK.); Fig. 2, L. Feayana Gray; Fig. 3, L. Nuttalli R. & S. (one seed of *L. Cliffortiana* L. may be seen near the top of the picture); Fig. 4, L. Gattingeri Gray; Fig. 5, L. Canbyi Gray: Fig. 6, L. spicata Lam., var. originalis McVaugh; Fig. 7, L. spicata Lam., var. campanulata McVaugh; Fig. 8, L. puberula Mx.; Fig. 9, L. Kalmii L.; Fig. 10, L. glandulosa Walt.; Fig. 11, L. floridana Chapm.; Fig. 12, L. inflata L.; Fig. 13, L. Dortmanna L.; Fig. 14, L. amoena Mx.; Fig. 15, L. siphilitica L.; Fig. 16, L. Cardinalis L.

The seeds photographed were from the following specimens:

Fig. 1, Brooksville, Hernando Co., Fla., *Leeds*, Apr. 1931 (ANS); Fig. 2, *Mrs. Deam 5000* (M); Fig. 3, Wadesboro, Anson Co., N. C., *Leeds*, Jy. 1929 (ANS); Fig. 4, "cedar barrens," Jun. 1879, *Gattinger* (Mo); Fig. 5, Ellendale, Sussex Co., Del., *Commons*, Sep. 1895 (ANS); Fig. 6, Madalin, Dutchess Co., N. Y., *McVaugh 2674* (UP); Fig. 7, *House 20543* (NYS); Fig. 8, *Deam 35293* (ANS); Fig. 9, *Ehlers 1313* (ANS); Fig. 10, Miami, Dade Co., Fla., *Meredith*, Mar. 17, 1917 (ANS); Fig. 11, *Pennell 4186* (UP); Fig. 12, *Strausbaugh 309* (WVa); Fig. 13, Greenfield, Hillsboro Co., N. H., *Batchelder*, Aug. 14, 1911 (ANS); Fig. 14, *Biltmore herb. 622c* (UP); Fig. 15, *House 19001* (NYS); Fig. 16, *House 18994* (NYS).

The photographs of seed were all taken with the aid of a Bausch and Lomb 48 mm. microtessar lens. The magnification is approximately 12x.

Explanation of Text Figures

The lines showing the glacial moraines are taken from Antevs (*2*), and the position of the Fall Line is essentially that shown by Fenneman (*16*). A few records on the maps are indicated by circles rather than solid dots; these are doubtful either as to exact locality or as to exact identity of the plant in question.

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NOTES ON THE FLORA OF MICHIGAN—I[1]

Frederick J. Hermann

The records for the species here reported are based upon collections of either Mr. C. R. Hanes, of Schoolcraft, Michigan, or of the writer. Both Mr. Hanes' collections and the writer's are represented in the Herbarium of the University of Michigan, and duplicates of most of the writer's specimens have also been rather widely distributed among the larger herbaria of the eastern states. Determinations for Mr. Hanes' grasses have been verified by either Professor Hitchcock or Mrs. Chase, and for the confirmation of his other reported species the writer assumes the responsibility. Unless otherwise indicated,

[1] Paper from the Department of Botany and Herbarium of the University of Michigan, No. 576.

the report for each species represents the first record for Michigan so far as could be determined. The grass species prefixed by an asterisk are ascribed to Michigan in Hitchcock's *Manual of the Grasses of the United States* but without indication of locality, and their occurrence in Michigan is not represented on the distribution maps.

*Glyceria acutiflora Torr. Kalamazoo Co.: Schoolcraft Twp., June 3, 1934, *C. R. Hanes.*

The nearest known stations for this species are in southern Ohio and southern Indiana.

Muhlenbergia sylvatica Torr., f. attenuata (Scribn.) Palmer & Steyermark. Kalamazoo Co.: swamp, Prairie Ronde Twp., September 7, 1934, *C. R. Hanes.*

*Sporobolus asper (Michx.) Kunth. Kalamazoo Co.: along Grand Trunk Railway, Schoolcraft Twp., December, 1933, and Pavilon Twp., September, 1935, *C. R. Hanes.*

No doubt introduced. Recently reported also for Berrien County.[1]

Aristida dichotoma Mich.. Kalamazoo Co.: sterile, sandy soil, Charleston Twp., September 22, 1935, *C. R. Hanes.*

*Aristida basiramea Engelm. Kalamazoo Co.: sterile, sandy soil, Schoolcraft Twp., August 22, 1934, *C. R. Hanes.*

Leptoloma cognatum (Schult.) Chase. Kalamazoo Co.: common in sandy soil, Schoolcraft Twp., August 27, 1933, *C. R. Hanes.*

Reported by Hebert[2] for Berrien County and determination of specimen verified by C. C. Deam.

Scirpus debilis Pursh, var. Williamsii Fernald. Kalamazoo Co.: sandy soil, Eagle Lake, Texas Twp., August 26, 1935, *C. R. Hanes.*

Previously known, apparently, only from Massachusetts.

Scirpus Smithii Gray, var. setosus Fernald. Kalamazoo Co.: sandy shore of West Lake, Portage Twp., July 31, 1935, *C. R. Hanes.*

Carex vulpinoidea Michx., var. **pycnocephala**, var. nov., humilis, dense caespitosa; foliis angustis, rigidis; perigynio anguste lanceolato, gradatim in rostrum contracto, marginibus tenuibus haud cortice incrassatis.—Apparently confined to the Great Lakes region. Michigan: sandy shore of Big Stone Bay, Lake Michigan, 3½ miles west of Cecil Bay, Emmet County, August 14, 1934, *F. J. Hermann,* no. 6408 (type in Herbarium of F. J. Hermann); beach of Lake Huron, Mackinac Island, July 28, 1935, *H. A. Gleason, Jr.* Indiana: Steuben County, June 17, 1903, *C. C. Deam.* Minnesota: bog near Twin Ponds, Hubbard County, July 13, 1933, *J. B. Moyle,* no. 820.

From typical *Carex vulpinoidea* this variety differs in its narrowly

[1] Hebert, Am. Midl. Nat. **15**: 325. 1934.
[2] Ibid. 324.

lanceolate, very gradually beaked perigynia which are thin-edged and not at all corky-margined. In these characteristics it resembles *C. vulpinoidea* var. *setacea* (Dewey) Kükenthal, as interpreted by Bicknell[1] under *C. setacea* Dewey, from which it is readily distinguished by its low, densely cespitose habit, its narrow, rigid leaves, its short, broad and very congested inflorescence and its almost obsolete perigynium teeth.

Xyris caroliniana Walt. Kalamazoo Co.: West Lake, Portage Twp., August 23, 1934, *C. R. Hanes.*

Juncus militaris Bigel. Presque Isle Co.: mucky, drying bed of Lake Sixteen (Sect. 16, Twp. 36 N., R. 2 E.), Black Lake State Forest, 8 miles west of Hammond, August 12, 1935, *E. L. Miner*, no. 1562; August 27, 1935, *F. J. Hermann*, no. 7015 and September 13, 1935, *F. J. Hermann*, no. 7317.

Dr. E. L. Miner of Weber College, Ogden, Utah, recently turned over to the writer for determination a set of Junci which he had collected in the Douglas Lake region and among them was this species of the Atlantic slope. The most westerly stations previously known for this rush are in Oneida and St. Lawrence Counties, New York, so that the Michigan record represents a range extension of approximately 500 miles. A trip was made to Lake Sixteen by the writer two weeks after Dr. Miner's discovery of *Juncus militaris* and it was found to cover many acres of the drying, mucky lake bed near the northeastern shore. About one-fourth of the colony was forma *subnudus* Fernald.[2]

Lake Sixteen is situated on the sandy bed of former Lake Algonquin. It is bounded on the south by steep, sandy moraines covered with aspen and white pine, and on the east, north and west by plains where the forest is a mixture of aspen, white and jack pine, red maple, red oak and canoe birch.

The only plant growing with *Juncus militaris* at this station is *Scirpus acutus*, but toward the shore its associates are largely either coastal plain species or species having their nearest allies in others of that floristic element, such as *Solidago hirtella* Greene which apparently has been derived from the coastal *S. graminifolia* var. *Nuttallii*. The sandy and peaty margin of the lake is occupied by *Juncus pelocarpus*, *Eriocaulon septangulare*, *Viola lanceolata* and *Hypericum ellipticum*. This peaty zone extends shoreward for about fifty feet and is succeeded

[1] Bicknell, Bull. Torr. Bot. Club 23: 24. 1896.
[2] Fernald, Rhodora 24: 166. 1922.

by a sandy beach where the following additional species come in: *Muhlenbergia uniflora, Drosera intermedia, Panicum meridionale* var. *albemarlense, Utricularia cornuta, Solidago hirtella* and *Bartonia virginica.*

The presence of *Juncus militaris* in Michigan near the northwestern end of Lake Huron is further evidence corroborating the hypothesis of a former migratory route for coastal plain species along the shore of the glacial lakes and their Hudson Valley outlet to the Hudson-Champlain Estuary.

Juncus effusus L., var. compactus Hoppe. Alger Co.: sandy border of black spruce bog, West Branch of Manistique Creek, 6 miles east of Shingleton, August 14, 1934, *F. J. Hermann,* no. 6394.

This is the first Michigan record for this eastern and European variety. Fernald and Wiegand[1] cite specimens ranging from Newfoundland southward along the coast to Massachusetts.

Juncus effusus L., var. decipiens Buchenau. Chippewa Co.: wet, rocky shore of Sugar Island, 1½ miles northwest of Homestead, September 2, 1935, *F. J. Hermann,* nos. 7122 and 7136.

The westernmost stations cited by Fernald and Wiegand[2] for this variety of the Northeast and of eastern Asia are Plevna and Algonquin Park, Ontario. At Sugar Island it was found to be locally plentiful along the rocky and sandy shores of Lake George. Another station at Haviland Bay on Lake Superior, Sault Ste. Marie District, Ontario (*F. J. Hermann,* nos. 7281 and 7291), may be noted here as being slightly farther west than the Sugar Island locality.

Pilea fontana (Lunell) Rydb. Washtenaw Co.: open marshy bank of Huron River, 2 miles east of Ann Arbor, August 24, and September 22, 1935, *F. J. Hermann,* nos. 7003 (in flower) and 7341 (in fruit).

Reported from North Dakota, Nebraska and Indiana.[3]

P. fontana seems to be a plant of open marshy or boggy situations, while the usual habitat of *P. pumila* is moist, shaded woods. At the Ann Arbor station it densely carpets the marshy river's edge for several hundred yards and has much the aspect of a bed of seedlings, the fruiting plants averaging six inches in height, although occasional individuals are fully as large as *P. pumila.* It is here associated with *Pedicularis lanceolata, Agrostis perennans, Juncus effusus* var. *Pylaei,*

[1] Fernald and Wiegand, Rhodora 12: 85. 1910.
[2] Loc. cit. 87.
[3] See also Fernald, Rhodora 38: 169–170. 1936.

Scirpus validus, Equisetum palustre, Lobelia siphilitica, Juncus Dudleyi, Eupatorium perfoliatum, Gentiana Andrewsii, Carex Pseudo-Cyperus, C. Bebbii, Scirpus atrovirens, Bidens trichocarpa, Aster puniceus and *Carex hystricina.*

Lepidium perfoliatum L. Kalamazoo Co.: alfalfa field, Schoolcraft Twp., May 26, 1935, *C. R. Hanes.* Doubtless introduced. Reported for Washtenaw County by Walpole.[1]

Lechea Leggettii Britt. & Hollick. Kalamazoo Co.: sand dunes, Austin Lake, Portage Twp., October 10, 1934, *C. R. Hanes.*

Hydrocotyle americana L. Chippewa Co.: abundant on wet, mossy floor of balsam-arbor-vitae-birch woods, ½ mile south of Homestead, Sugar Island, September 5, 1935, *F. J. Hermann,* no. 7199.

The only record of this species for the Upper Peninsula is that reported by Kenoyer[2] as "Chippewa Co., Lewis Foote, 1867."

Myosotis micrantha Pallas. Washtenaw Co.: gravelly roadside, 1½ miles south of Portage Lake, May 20, 1935, *F. J. Hermann,* no. 6485; waste ground, U. of M. Botanical Gardens, May 25, 1935, *F. J. Hermann,* no. 6508.

Apparently of recent introduction in Michigan. It is abundant at both the above localities. The American range of this weedy exotic is usually given as "Mass. to Ont. and O.," but according to Schaffner[3] the Ohio report is unauthenticated.

Salvia lanceifolia Poir. Kalamazoo Co.: field near hog yard, Schoolcraft Twp., August 21, 1935, *C. R. Hanes.* Probably introduced with grain.

Gerardia Gattingeri Small. Kalamazoo Co.: edge of marsh, Schoolcraft Twp., August 30, 1935, *C. R. Hanes.* Reported for Oakland County by Pennell.[4]

Liatris punctata Hook. Kalamazoo Co.: a single plant on roadside near prairie, Schoolcraft Twp., August 16, 1933, *C. R. Hanes.*

Boltonia asteroides (L.) L' Hér. Monroe Co.: wet, sandy shore of sluggish creek 5 miles southeast of Erie, August 10, 1935, *F. J. Hermann,* no. 6929.

Not previously recorded from the Michigan shore of Lake Erie. It is plentiful at this locality near the Ohio state line and was also found to be abundant on the Lake Erie shore two miles east of Erie but at this date was not yet in flower at the latter station. Beal, in *Additions to the Michigan Flora,*[5] gives Van Buren County, *H. S.*

[1] Walpole, Flora of Washtenaw County, Michigan. 1924.

[2] Kenoyer, Papers Mich. Acad. Sci. **3**: 154. 1923.

[3] Schaffner, Ohio Biol. Surv. Bull. **25**: 183. 1932.

[4] Pennell, Proc. Acad. Nat. Sci. Phila. **81**: 216. 1929.

[5] Beal, Tenth Ann. Report Mich. Acad. Sci. 85. 1909.

Pepoon, as the only Michigan report for this species which is generally considered a member of the coastal plain flora.

HELENIUM NUDIFLORUM Nutt. Kalamazoo Co.: moist soil southwest of Camp Custer, August 20, 1935, *H. R. Becker*.

CHONDRILLA JUNCEA L. Kalamazoo Co.: sandy soil, Portage Twp., August 8, 1934, *C. R. Hanes*.

LACTUCA SALIGNA L. Washtenaw Co.: dry, sterile bank of Huron River, Shanghai Pit, 3 miles northwest of Ypsilanti, August 4 and 15, 1935, *F. J. Hermann*, nos. 6922 and 6972.

This European weed, although known from Ohio for several decades, seems only lately to be spreading rapidly, as the Indiana, Missouri and California reports are recent and the writer has not succeeded in finding other Michigan records. The flowers in the Washtenaw County colony were deep blue instead of the yellow prevalent in § *Scariola;* but since they were partly wilted when found, this color may have been due to oxidation. Reports by others who have observed the plant in the field are not in agreement upon the flower color.

UNIVERSITY OF MICHIGAN.

A NOTE ON SPECIES DIFFERENTIATION IN ANTENNARIA

G. LEDYARD STEBBINS, JR.

IN a recent publication (RHODORA **38**: 231. 1936) Dr. Fernald has ascribed to me the principle that, "we are to distinguish as species the bisexual and parthenogenetic series which show no other appreciable differences." In answer to this contention, I wish to reply that I have never held to this or any similar principle, and that no mention has ever been made of it in any of my publications. Furthermore, two papers now in manuscript or in preparation which discuss bisexual and parthenogenetic races in species of *Crepis* and *Youngia* will demonstrate even more clearly that no such principle is held. In the case of *Antennaria*, which was the subject of Fernald's discussion, I have long been aware that in some species, e.g. *A. Parlinii* and *A. fallax*, both bisexual and parthenogenetic races exist, just as they do in the species of *Crepis* and *Youngia* which are the subject of these forthcoming papers, and it is for this reason that in my discussion of the differences between *A. virginica* and *A. neodioica*

(Rhodora **37**: 231–233), no mention was made of this difference. The validity of *A. virginica* was judged chiefly on the basis of the width of the cauline leaves and involucral bracts, the character of the inflorescence, the length of the corollas, the frequent presence of flat scarious tips on the upper cauline leaves in typical *A. virginica*, and the pitting of the receptacle. All of these are characteristics used by Fernald as the major differences between *A. rupicola* and *A. neodioica* (Rhodora **35**: 330); between *A. gaspensis* and its relatives and the group of *A. neodioica* (l. c. 329), and in many other cases (cf. Wiegand & Eames, The Flora of the Cayuga Lake Basin. 408–410. 1924). Nevertheless, in his reduction of *A. virginica* to a variety of *A. neodioica*, Fernald makes no discussion of these characteristics, but relies only on the overlapping in the size of the rosette leaves, a character not even mentioned by me as a significant difference between the two species, and the height of the involucres, considered by me (Rhodora **37**: 231) as "somewhat smaller" in *A. virginica* than in *A. neodioica*, and hence a character of only secondary importance. Fernald's negation of this character is undoubtedly justified, on account of the errors made by me in my statement of the measurements, although in both cases the figures of wider scope (*i.e.* 4.5–6.5 mm for *A. virginica* and 5–7 mm for var. *argillicola*) are those based on the final series of specimens examined, and those intended. His statement, however, that, "it is easy to find plants of [*A. neodioica*] var. *attenuata* with involucres 5.5–7 mm high" (*l. c.*) is surprising in view of the fact that in 1933 he himself characterized the involucres of this species and its relatives as "(6–) 7–10 mm high" (Rhodora **35**: 329, under "b" in key), and contrasted with this (*l. c.* 328, under "b") the involucres of certain Newfoundland species as "if pale, at most 7 mm high." The only other differences used under this heading of the key were those of stature and of leaf size, shape, and tomentum, none of which can be considered of major importance, and in some of which (stature, width of basal leaves, reduction of the terminal mucro on the basal leaves) these Newfoundland species are approached or even equalled by forms of *A. virginica*. When writing my discussion of *A. virginica* and *A. neodioica*, I had this paper of Dr. Fernald's before me, and relied in part on the accuracy of the measurements given in it, since I felt that they had been based on his customary careful examination of a large series of specimens. The involucres of *A. neodioica* less than 7 mm high were found at that time to belong

either to immature or abortive specimens, or to plants judged by me to be var. *typica* rather than var. *attenuata*, and are included (Rhodora **37**: 234) in my table under the former variety.

I recognize that there is overlapping between *A. virginica* and *A. neodioica* in some characteristics, but since I am aware of an equal amount of overlapping between *A. fallax* and *A. Parlinii* (particularly in the southern and western portions of their range), *A. neglecta* and *A. petaloidea* (chiefly in Wisconsin), *A. petaloidea* and *A. neodioica* (throughout the north central states), and *A. Parlinii* and *A. Brainerdii* (in central New York) I feel that, in the interests of consistency, the reduction of *A. virginica* to a variety calls for a similar reduction of *A. Parlinii, A. petaloidea, A. Brainerdii,* and probably other species now recognized in the floras of Eastern North America.

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NOTES ON VERNONIA

Bernice G. Schubert

In organizing the North American material of the genus Vernonia at the Gray Herbarium, the following two changes in rank seem necessary; the first, from a purely taxonomic point of view, and the second from both taxonomic and nomenclatorial considerations.

Vernonia scaberrima Nutt. var. **pulchella** (Small), comb. nov. *V. pulchella* Small, Bull. Torrey Club, xxv. 145 (1898).

In 1898 Small established *Vernonia pulchella* as a species, defining it as related to *V. scaberrima* Nutt. and adding "It is, however, more robust in habit, and has larger serrate leaves which are destitute of the peculiar base characteristic of *Vernonia scaberrima*. The tips of the involucral bracts are more slender and less rigid than those of its relative."

The type specimen, collected by Small "on sand hills bordering the Altamaha River swamps in Liberty county, Georgia, in July 1895," is a plant with leaves varying in character of the base from acute to definitely amplexicaul. Surely this plant, obviously related to *V. scaberrima* Nutt. in all its characters, which presents in its leaf-character a series clearly including the *V. scaberrima* type (subamplexicaul base), in large proportion, cannot justifiably be separated as a distinct species.

Comparison of the leaves of Small's type, kindly loaned by Dr. Gleason, with fragments of *V. scaberrima* from the herbarium of Dr. Baldwin shows close similarity, a lower leaf of Baldwin's specimen conforming almost exactly to Small's description; and a note with the above fragments in Dr. Asa Gray's handwriting indicates that the lowest leaves were "broadish." Therefore, judging from the size of the leaves found, the lowest leaves were certainly comparable in size to those of Small's specimen. Another specimen of *V. scaberrima* in the Gray Herbarium, from the Herbarium of the Academy of Natural Sciences in Philadelphia, which was examined for the Synoptical Flora of North America, has leaves almost identical with the upper leaves of a specimen identified as *V. pulchella* by H. A. Gleason and collected by A. H. Curtiss in Oct. 1880 in "dry pine barrens, Altamaha River, Georgia," obviously close to the type locality. The right-hand specimen on sheet No. 161 and an unnumbered sheet collected at the same time and place by Curtiss conform in leaf-character to Small's type; but, while the specimen of one sheet has involucral bracts typical of Small's *V. pulchella*, the other two on sheet No. 161 have the involucral bracts "filiformly terminated as in *V. noveboracensis*" which is in accordance with Nuttall's description of *V. scaberrima* Nutt. Gen. ii. 134 (1818). Since there can be no clear differentiation on the basis of leaf-character it seems justifiable to designate Small's type and specimens close to it in both character of leaves and involucral bracts as a variety of *V. scaberrima* which differs from the species only in the involucre. The bracts of the varietal type are definitely recurved, whereas in the specific forms they are erect or spreading and, if recurved, never to the extent or with the regularity of the varietal type.

Vernonia Baldwini Torr., var. **interior** (Small), comb. nov. *V. interior* Small, Bull. Torr. Bot. Club xxvii. 279 (1900).

From a nomenclatorial point of view the status of the two forms, *Vernonia Baldwini* Torr. and *V. interior* Small, has long been uncertain, because of absolute violation of rules of priority by various students of the group.

Vernonia Baldwini was established as a species by Torrey, Ann. Lyc. N. Y. ii 211 (1827); *V. interior* was established by Small seventy-three years later in Bull. Torrey Club xxvii. 279 (1900). Since Small, various students have felt that these two forms are close enough taxonomically so that specific rank is unjustifiable for both. The only

valid procedure, therefore, is to reduce the later species to a variety of the earlier, leading to the combination *V. Baldwini* Torr., var. *interior* (Small). However, this step was not taken directly. In 1902 Mackenzie and Bush (Man. Fl. Jackson Co. Mo. 190) reduced *V. Baldwini* Torr. to a variety of *V. interior* Small, producing the combination *V. interior* Small var. *Baldwini* (Torr.) Mackenzie and Bush.

In 1906 Gleason (A Revision of the North American Vernonieae, Bull. N. Y. Bot. Gard. iv. 153. (1906) stated that, nomenclatorially, the procedure of Mackenzie and Bush was invalid and that the name should be *V. Baldwini interior*, but he also maintained that, based on taxonomic characters and geographical distribution *V. Baldwini* was only an eastern form of the more widely distributed *V. interior*, and, as such, should be maintained as the variety, regardless of nomenclatorial ruling. Gleason's mere statement of the proper combination does not constitute publication, because, according to international ruling "A name of a taxonomic group is not validly published unless it is definitely accepted by the author who publishes it. . . ." (Art. 37 ter. from Rec. Syn. 41, 1930; and Brit. Prop., Art. 44, p. 16, 1929. See also Sprague, Journ. Bot. lxxiv. 75 (1936).) Definitely, Dr. Gleason rejects the proper combination in the very act of stating it, and in the same paper applies his description of the form in question to the name *V. interior Baldwini.*

From a taxonomic standpoint the two forms in question are closely related. Dr. Robinson, in his treatment of the genus for Gray's Manual (7th edition), noted, after his discussion of *V. Baldwini:* "*V. interior* Small, though sometimes distinguishable by its less squarrose mostly purple-tinged bracts, does not appear satisfactorily separable."

The chief character for differentiation between the two forms lies in the involucral bracts. In *V. Baldwini* Torr. essentially all the bracts are squarrose to reflexed, in *V. interior* Small only a few bracts of any given involucre are squarrose or reflexed. The distinction between the two forms has been proven by a close study of herbarium specimens. Dr. Gleason in his latest study of the group maintains that the bracts of *V. Baldwini* are pubescent and resinous within the squarrose or reflexed tips, and that the bracts of *V. interior* are glabrous within. However, an examination of herbarium material proved that in most cases where any involucral bracts of specimens of *V. interior* were reflexed there was a certain amount of pubescence or resin

within. This difference, then, is also one of degree. Therefore, since from a taxonomic standpoint one species is a variety of the other, according to nomenclatorial ruling the name of the variety should be established as *Vernonia Baldwini* Torr. var. *interior* (Small).

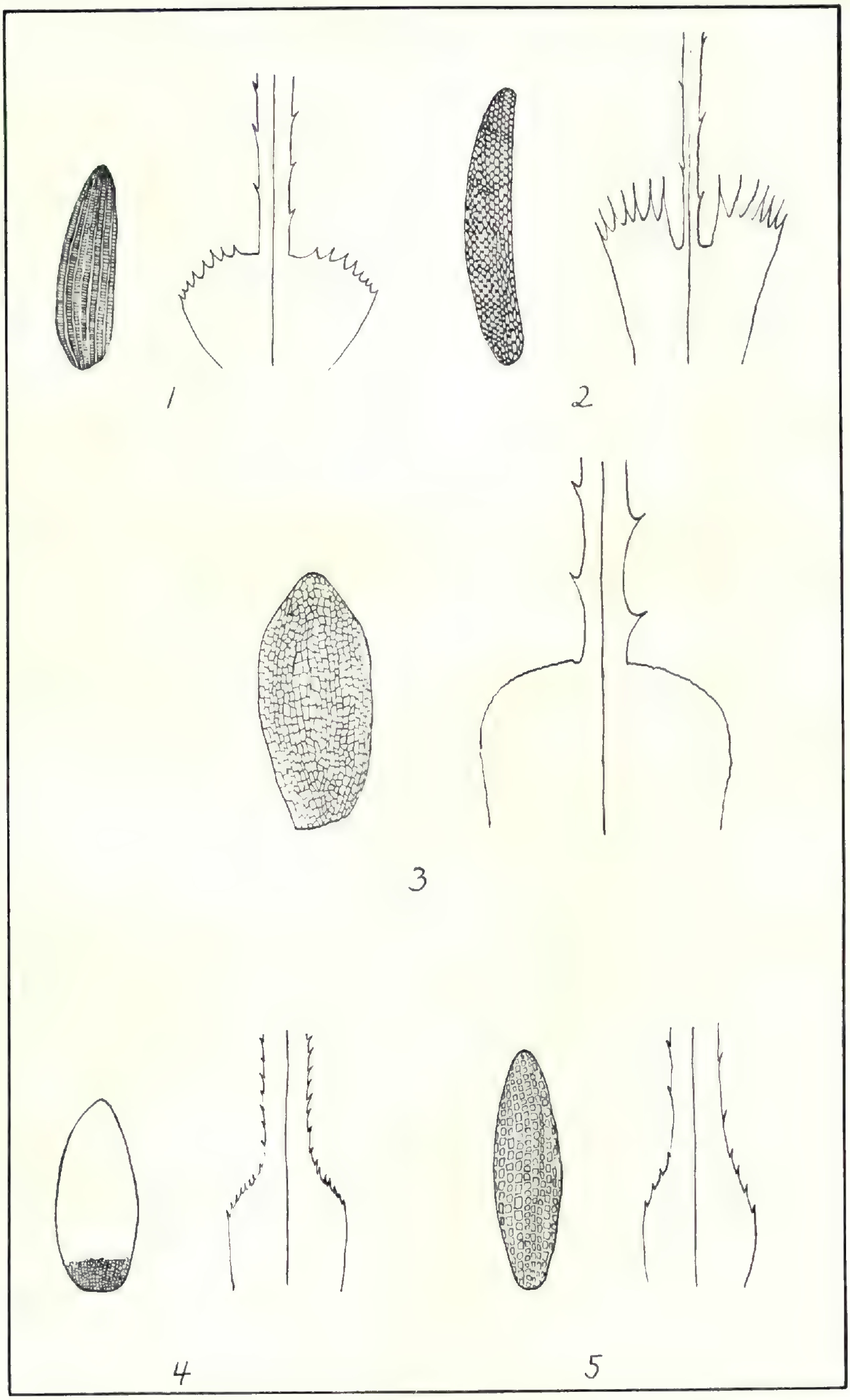
In conclusion I should like to express my appreciation to Professor M. L. Fernald for his interest and helpful suggestions throughout this study.

Radcliffe College.

Hypericum mutilum L., var. **latisepalum,** var. nov., sepalis late lanceolatis vel oblongis foliaceis.—Florida to Texas. Type: low grounds, Duval Co., Florida, June–August, *A. H. Curtiss*, no. 264* (distributed as *H. mutilum*, var. *gymnanthum*) in Gray Herb.

A characteristic southern extreme. Typical *Hypericum mutilum* L., as noted for me by Mr. C. A. Weatherby upon study of the type (*Clayton*, no. 232) in the summer of 1935 and as further demonstrated by a photograph of it secured by him through Mr. J. Ramsbottom, is the wide-spread plant with sepals linear or narrowly lanceolate, only one or two of them exceptionally broader. In var. *latisepalum* all the sepals are dilated.—M. L. Fernald, Gray Herbarium.

Volume 38, no. 453, including pages 301–332 and plate 436, was issued 19 September, 1936.



LEAF-BASES, × 8, AND SEEDS, × 8, OF NAJAS.

FIG. 1, N. MINOR; FIG. 2, N. GRACILLIMA; FIG. 3, N. MARINA; FIG. 4, N. FLEXILIS; FIG. 5, N. GUADALUPENSIS.

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Rhodora

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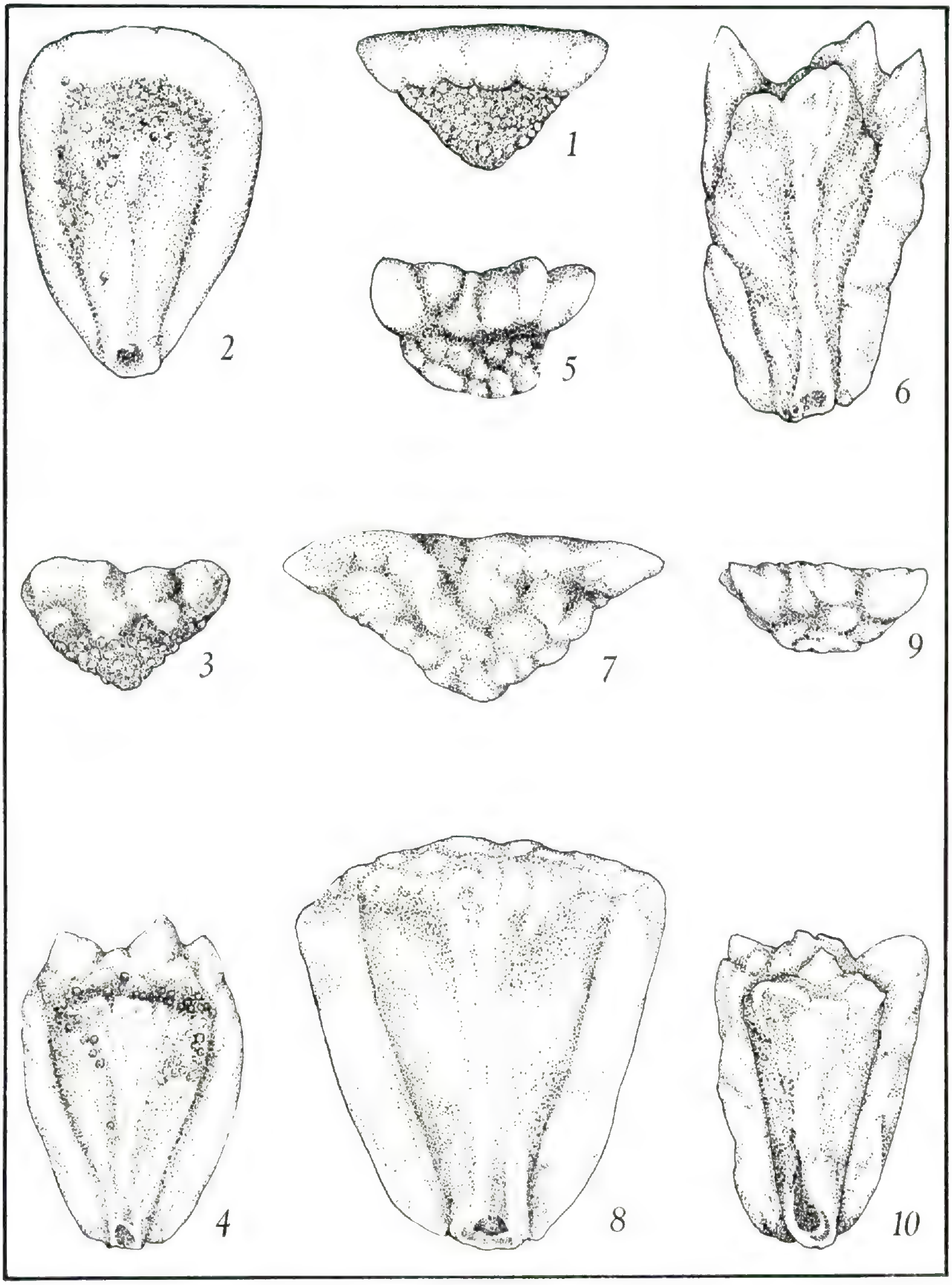

Nutlets of Lycopus, × 28.

L. americanus: fig. 1, apical view; fig. 2, ventral view.
L. uniflorus: fig. 3, apical view; fig. 4, ventral view.
L. virginicus: fig. 5, apical view; fig. 6, ventral view.
L. asper: fig. 7, apical view; fig. 8, ventral view.
L. rubellus: fig. 9, apical view; fig. 10, ventral view.

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DIAGNOSTIC CHARACTERISTICS IN LYCOPUS

FREDERICK J. HERMANN[1]

(Plate 439)

DURING several summers of botanizing in Michigan the writer has noted the frequent occurrence of plants of *Lycopus americanus* Muhl. in which the pinnatifid or incised leaves commonly ascribed to that species were altogether lacking. Since this feature has been used almost invariably in the keys of our manuals as the sole character distinguishing *L. americanus* from its immediate allies of eastern North America it is not surprising that in herbaria we so often find the merely serrate-leaved individuals of this species referred to various other species. In attempting to find other diagnostic characteristics to supplement the traditional key character for *L. americanus* the pronounced individuality of its fruit became apparent as, indeed, did that of many of our other species.

It is remarkable that the characteristics of the nutlets in this genus (perhaps, for that matter, in the whole family) have received so little attention, particularly when we consider the importance attached to the morphology of the fruit in so many genera of the closely related *Boraginaceae*. And what study the nutlets have received (outside Penland's study of *Scutellaria*[2]) seems to have been largely superficial. Bentham,[3] treating the *Labiatae* in DeCandolle's Prodromus,

[1] Paper from the Department of Botany and Herbarium of the University of Michigan, no. 577.

[2] Penland in RHODORA **26**: 61–79, plates 140 and 141. 1924.

[3] Bentham in DeCandolle, Prodromus **12**: 177. 1848.

refers to them as "siccae, laeves, margine callosa incrassato trigonae, apice truncatae, basi attenuatae," and supplements this description with "nuculis majoribus minoribusve plus minus glandulosis." That the mature mericarps of most *Lycopodes* could be called "smooth" seems astonishing after one has examined those of any appreciable number of species. In the descriptions of the ten species which Bentham recognizes under the genus the fruit receives little further comment except for one species: of *L. arkansanus* he says "nuculis scrobiculato-rugulosis apice dentatis." This is surely a far cry from "smooth" and, indeed, is a better description of the condition prevailing in *Lycopus* nutlets as a whole than is "laevis." Briquet's description[1] "Nüsschen tetraëdrisch, mit verdicktem Rande und abgestutzten Scheitel, glatt") is essentially a repetition of Bentham's while Gray[2] and most subsequent American authors characterize the fruit even more briefly, the great majority, if not all, referring to it as "smooth." If this term is not often definitely misleading it would seem advisable that it be employed less unreservedly, at least, in consideration of the predominantly sculptured margin and apex of the nutlet.

In the following key an attempt is made to indicate briefly the characteristics of the fruit of the species of *Lycopus* native to northeastern North America. It is hoped that such a key may prove useful as a supplement to others based primarily upon floral and vegetative characters.

Lycopus

Lateral and apical angles on the dorsal face of nutlets much thickened to form a generally conspicuous ridge, the apical ridge entire, or thin- and undulate-margined, or thick and erose to tuberculate-margined; nutlets with the lateral faces (sometimes also the apical and dorsal faces) often more or less glandular-dotted.

a. Ridge of nutlets entire, relatively soft and corky, conspicuous on all three dorsal angles; calyx lobes awn-tipped, rigid. .... *L. americanus* Muhl. (Figs. 1–2).

a. Ridge of nutlets not entire, generally less conspicuous or not at all evident on the lateral angles; calyx lobes blunt to acuminate, not, or but slightly, rigid....*b*.

b. Calyx lobes deltoid or lanceolate, thin and blunt, not, or scarcely, exceeding the mature nutlets.

Top of nutlet smooth or shallowly rugose, glandular-dotted; apical ridge erose to tuberculate............ .... *L. uniflorus* Michx. (Figs. 3–4).

[1] Briquet in Engler-Prantl, Pflanzenfamilien 4, 3a: 316. 1897.

[2] Synoptical Flora, vol. 2, part 1: 343, and 352–353. 1886.

Top of nutlet, as well as apical ridge, deeply muricate; nutlets very asymmetric; fascicles broad, very densely fruited, the mature nutlets usually largely concealing the calyces . . . . *L. virginicus* L. (Figs. 5–6).

b. Calyx lobes narrow, acuminate, much exceeding the mature nutlets.

Top of nutlet rugose-verrucose, the projections shallow; apical ridge scarcely evident; dorsal face of nutlet much broader than the lateral faces . . . . *L. asper* Greene (Figs. 7–8).

Top of nutlet verrucose to tuberculate; apical ridge well produced; nutlets (seen from above) more or less equilateral.

Leaves sessile . . . . *L. sessilifolius* Gray.

Leaves contracted into a petiole . . . *L. rubellus* Moench (Figs. 9–10).

University of Michigan.

Nymphaea tetragona in Maine.—In August, 1934 when returning from an automobile trip through parts of New Brunswick and Nova Scotia, we stopped in northern Maine at Portage on Portage Lake. We took a small motorboat, with canoe in tow, across the lake and about four miles up the narrow Fish River, beyond Chase Brook. In botanizing that area in the canoe for *Potamogeton, Sparganium*, etc., I found a nice shallow bay, and noticed *Nymphozanthus microphyllus* (Pers.) Fern. and an equally small-flowered white waterlily. Most of the summer's collection was identified the following year at Northampton, but the white waterlily was put aside to be verified later. On one of my trips to the Gray Herbarium Professor Fernald identified it as *Nymphaea tetragona* Georgi, a species not mentioned in Gray's Manual. The plant is frequent in Asia, but has been collected at only a few places in North America: in Idaho, Ontario, Keewatin, and on Isle Royale, Michigan.[1]

Specimens will be deposited in the Smith College herbarium and in the Gray Herbarium.—Wayne E. Manning, Smith College.

[1] Professor Manning's discovery of *Nymphaea tetragona* in northern Maine is most gratifying. A supposition that it occurs in the upper St. John waters is thus supported. The late Cyrus G. Pringle once told the Editor-in-Chief of finding a tiny-flowered *Nymphaea* somewhere on the St. John system, during one of his trips in the 70's. Through the capsizing of his boat the material was lost, and Dr. Manning's is the first collection from the region to stand as a voucher.—Eds.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXV

PLANTS FROM THE OUTER COASTAL PLAIN OF VIRGINIA

M. L. Fernald

(Plates 440–452)

Continuing[1] our field work in easternmost Virginia, my companions and I made four brief excursions in 1935 to the outer Coastal Plain; and during the season of 1936, as the guests of my former student, Professor Robert F. Smart at the University of Richmond, we have, similarly, had four trips to the inner Coastal Plain, adjacent to the Piedmont region of the state. In this report the plants of special significance collected in 1935 are chiefly discussed; in a later paper those of 1936 will be considered.

Geologically, the Coastal Plain in the southeastern corner of Virginia has two sharply differentiated areas: west of the Dismal Swamp the region consists of Tertiary deposits, with beds of Miocene fossil shells underlying the superficial sands, clays and peats; east of the Dismal Swamp and south of the entrance to Chesapeake Bay the Tertiary beds are deeply buried under Quaternary sands and clays. The reflection in the flora of this difference in surface soils is vivid and will be more fully considered in a succeeding paper. There is, of course, a general floral similarity and the majority of species are identical in the two areas: *Pinus Taeda*,[2] *Taxodium distichum, Arundinaria tecta, Uniola laxa, Danthonia sericea, Tripsacum dactyloides, Cyperus pseudovegetus, ovularis* and *lancastriensis, Eleocharis simplex* and *tuberculosa, Rynchospora corniculata, cymosa* and *inexpansa, Carex styloflexa, abscondita* Mackenzie and *verrucosa, Xyris caroliniana* and *difformis, Commelina virginica, Juncus setaceus, debilis, scirpoides* and *marginatus, Smilax rotundifolia, Bona-nox* and *Walteri, Iris virginiana, Habenaria cristata, Tipularia discolor, Saururus cernuus, Populus heterophylla, Carya alba* and *glabra, Myrica cerifera, Carpinus caroliniana, Betula nigra, Fagus grandifolia, Quercus alba, falcata, nigra, phellos* and *stellata, Morus rubra, Magnolia virginiana,*

[1] See Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, Rhodora, xxxvii. 129–157 and 167–189 (1935)—Contrib. Gray Herb. no. CVII. Also Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, Rhodora, xxxvii. 378–413, 423–554 (1935)—Contrib. Gray Herb. no. CIX.

[2] Authors are given only for names not in Gray's Manual.

Itea virginica, Liquidambar Styraciflua, Rosa palustris, Tephrosia spicata, Desmodium nudiflorum, viridiflorum and *lineatum, Clitoria mariana, Centrosema virginianum, Polygala incarnata, Rhus copallina, Ilex glabra, Euonymus americanus, Berchemia scandens, Vitis rotundifolia, Hibiscus Moscheutos, Ascyrum stans, Hypericum petiolatum, Helianthemum canadense, Passiflora incarnata, Ludwigia alternifolia* and *glandulosa, Aralia spinosa, Cornus stricta, Nyssa aquatica, Oxydendrum arboreum, Vaccinium stamineum, Diospyros virginiana, Symplocos tinctoria, Fraxinus caroliniana, Gelsemium sempervirens, Sabatia angularis, Asclepias variegata, Ipomoea pandurata, Callicarpa americana, Scutellaria ovalifolia* Pers., *Monarda punctata, Mimulus alatus, Gratiola pilosa, Bacopa acuminata, Bignonia capreolata, Oldenlandia uniflora, Viburnum nudum, Lobelia puberula, Elephantopus nudatus* and *tomentosus, Eupatorium coelestinum, Chrysopsis graminifolia, Solidago pinetorum* Small, *Aster gracilis, Pluchea foetida, Helianthus atrorubens, Verbesina occidentalis* and *Pyrrhopappus carolinianus.* These and hundreds of others abound in their proper habitats both east and west of the Dismal Swamp.

To the eastward, on the outer half of the Coastal Plain in Norfolk and Princess Anne Counties, other scores of species are found which we do not know on the inner half of the Coastal Plain in Virginia or which are there highly localized. Some of these have been noted in two preceding papers; others are here to be specially discussed. This large flora, in Virginia restricted to or best developed in the two southeastern counties, includes such very characteristic plants as *Pinus serotina, Typha truxillensis* HBK., *Sagittaria falcata* Pursh, *Triglochin striata, Limnobium Spongia, Uniola paniculata, Sacciolepis striata, Cyperus Haspan, Eleocharis quadrangulata, Fimbristylis puberula* and *Baldwiniana* (Schultes) Torr., *Fuirena squarrosa, Rynchospora fascicularis* (Michx.) Vahl, *Cladium jamaicense* Crantz, *Scleria setacea* Poir., *Lemna valdiviana, Myrica pensilvanica* Loisel., *Quercus virginiana* and *cinerea* Michx., *Arenaria lanuginosa* (Michx.) Rohrb., *Ranunculus hederaceus* and *pusillus, Persea palustris* (Raf.) Sarg., *Drosera intermedia* Hayne, *Decumaria barbara, Crataegus Youngii* Sarg., *Linum medium* var. *texanum* (Planch.) Fern., *Xanthoxylum Clava-Herculis, Ilex vomitoria, Ampelopsis arborea, Viola pectinata, Ludwigia pilosa* Walt. and *brevipes* (Long) E. H Eames, *Eryngium aquaticum, Centella repanda* (Pers.) Small, *Vaccinium*

macrocarpon, Sabatia gracilis, Asclepias lanceolata, Dichondra repens Forst. var. *caroliniensis* (Michx.) Choisy, *Lippia nodiflora* and *lanceolata, Bacopa Monnieria* var. *cuneifolia* (Michx.) Fern., *Galium hispidulum, Lobelia elongata* Small, *Eupatorium serotinum, Erigeron vernus* and numerous others. Some of these are obviously controlled by proximity to the sea, but brackish water extends far up the James and its tributaries, nearly to the Fall Line, and dry white sands with plants characteristic of Cape Henry occasionally occur inland.

West of the Dismal Swamp, from Nansemond County to the Fall Line, the characteristic or distinctive plants are more numerous. In 1935 this area was only slightly examined, chiefly in the region of Kilby (west of Suffolk), but even in that brief half-day the contrast with Norfolk and Princess Anne Counties was striking, in the occurrence of such plants (not seen by us farther east) as *Polypodium polypodioides, Pinus echinata, Uniola latifolia, Gymnopogon ambiguus, Fuirena hispida, Scleria pauciflora, Uvularia puberula, Aletris farinosa, Hypoxis micrantha* Pollard, *Iris verna, Habenaria ciliaris, Malaxis n. sp., Ulmus alata, Asarum virginianum, Psoralea pedunculata, Rhynchosia erecta* and *tomentosa, Polygala Curtissii, Lyonia mariana, Vaccinium virgatum* var. *tenellum, Solidago yadkinensis, Aster patens* and *linariifolius, Parthenium integrifolium* and *Arnica acaulis.* These species, all occurring westward into either Southampton, Greensville, Sussex, Dinwiddie, Prince George or Chesterfield County or into more than one of them, consequently belong to the very extensive flora more particularly examined in 1936, to be discussed in a later paper.

Our collecting trips in easternmost Virginia in 1935 were four. In May (4–8) Mr. Ludlow Griscom and I centered again at Virginia Beach and drove over as much territory in Princess Anne and Norfolk as the limited time would allow. Spring vegetation was in its prime, with some species already passed or passing, and again we were impressed by the Alleghenian element in the flora of these coastal counties, such inland plants as *Liparis liliifolia, Dentaria laciniata, Oxalis violacea, Galax aphylla* and *Carex digitalis* seeming almost out of place. *Carex* was already in good condition and we were able to extend the ranges northward into Virginia of *C. flaccosperma* and *C. folliculata* var. *australis* Bailey (*C. Smalliana* Mackenz.). *Arisaema* presented new problems for solution and some other questions arose, to be dealt with in this or in a subsequent series of studies with Mr. Griscom.

In June (16–21) Mr. Bayard Long was, happily, able to join us. The same general area, with a flora strikingly unlike the spring flowers of our earlier trip, was again covered. The rich woodlands of Great Neck and of Little Neck (projecting into Lynnhaven Bay) yielded further surprises, including a remarkable new *Juncus*, simulating *J. effusus*, but with the capsule strongly beaked as in the famously localized *J. gymnocarpus* Coville. A strange *Bumelia*, discovered by Griscom and me in young foliage in May, was now coming into flower (collected by Long and me in mature fruit in September). One of the most productive trips included a brief landing at the southern end of Cedar Island, in Back Bay. Here, bordering marshes characterized by *Phalaris caroliniana* Walt. and other good species, the low woods, cut off from the open Atlantic only by the sandy outer bar of False Cape, suggested bottomlands of the rich Alleghenian forest, with lush tangles of *Elymus villosus* Muhl. and other Alleghenian types. Most surprising, however, was the occurrence of *Iresine rhizomatosa* Standl., a species heretofore known only from the interior (Texas to Kansas, east to Alabama and western Maryland). Obviously, Cedar Island needs more attention.

In September (5–13) Griscom, unfortunately, was unable to join us but we had a happy substitute in Professor John M. Fogg of the University of Pennsylvania, who joined Long and me with his car at Virginia Beach. Although Griscom and I had centered here in September, 1933, when we covered only the immediate vicinity, subsequent visits had introduced us to many stations in Princess Anne and Norfolk Counties, where the late-summer and autumn-flowering *Compositae*, *Gramineae* and *Cyperaceae* were bound to be interesting. This proved to be the case and when we were obliged to leave it was with full realization of the many spots where real discoveries can yet be made.

During this trip we ventured westward into Nansemond County, as already noted, and returning to Philadelphia and Cambridge, we crossed from Norfolk (or Willoughby Neck) to Old Point, thence to Yorktown and Fredericksburg. This was new territory for us, but, realizing that the Peninsula of Virginia (between the lower James to the south and the lower York to the north) had been well studied by the late Earl J. Grimes and Mrs. Grimes (later Mrs. Erlanson), we expected no special novelties. Having two hours of daylight which could be used, we decided to look for an unspoiled spot near Hampton.

In this we were partly successful; at least the clearing and peaty thicket where we stopped had its original flora largely undisturbed and, quite unwittingly, we added a considerable number of local species to the lists of the Grimes's collections[1]: *Lycopodium alopecuroides, Andropogon Elliottii, Cyperus sabulosus* Mart. & Schrad., *Rynchospora cymosa, Lechea Leggettii, Helianthus angustifolius,* and a remarkable and very handsome new *Aster,* to be described toward the end of this paper—a good two-hour's gleaning. Nearby, in disturbed soil, the Asiatic *Arthraxon hispidus* var. *cryptantherus* (Hack.) Houda, new to Virginia, was abundant.

It was already twilight when we approached Yorktown; but we were tempted to take a look at one or two of the "bays" or peaty and sandy depressions in the woods. Such depressions seemed to us the counterparts of the kettle-holes of Cape Cod, doubtless of different origin but with resultant belts of similar wet and successively drier and drier sand. One was filled with the giant *Rynchospora corniculata,* not in any of the Grimes lists. Another (the only one we had time to search, on hands and knees in essential darkness), close to the road, made us think of Cape Cod, through the abundance of *Stachys hyssopifolia,* not in the Grimes lists. Here, likewise new to the Peninsula, were other species: *Solidago pinetorum* Small and *Pluchea viscida* (Raf.) House (*P. petiolata* Cass.). Several such "bays" were noted in the dark, to the south of Yorktown; and after the moon rose we saw more to the northwest of Gloucester (John Clayton's home). On Cape Cod every such depression has its peculiarly localized species; if this be so on the peninsulas of Virginia, as it doubtless is, there will be good botanizing there for years to come.

With only limited time and then only by "cutting" classes, I was able to get off for a short time in October (11–16). Long was with me, for, with his detailed knowledge of Coastal Plain plants and their proper habitats and his unequalled persistence and skill in finding them, no critical botanizing in eastern Virginia can be wholly successful without him. Fogg joined us Saturday night with his car. This time we economized time by stopping north of Cape Charles, instead of crossing Chesapeake Bay to the southeastern counties. Here, on the Eastern Shore, we had a most interesting center at historic and

[1] See (1) Grimes, *Some Plants of the Virginia Coastal Plain,* Rhodora, xxiv. 148–152 (1922); (2) Weatherby, *Critical Plants of Atlantic North America,* Rhodora, xxv. 17–23 (1923); (3) Eileen Whitehead Erlanson, *The Flora of the Peninsula of Virginia,* Pap. Mich. Acad. Sci. Arts and Let. iv[1]. 115–182 (1924).

fascinating Eastville. We got essentially to the tip of Cape Charles (Kiptopeke) and left that area with the regret we had so often felt on having to quit, that there was a great deal yet to do. Many of the species which come north to Cape Henry are unknown on Cape Charles; several, supposed to reach their northern limit south of the Bay, are actually found north of it: *Andropogon scoparius*, var. *tenuispatheus* (Nash) Fern. & Grisc., *Paspalum setaceum* var. *supinum* (Bosc.) Trin., *Panicum anceps* var. *rhizomatum* (Hitchc. & Chase) Fern., *Axonopus furcatus, Uniola paniculata, Rynchospora inexpansa, Nothoscordum bivalve, Quercus virginiana, Xanthoxylum Clava-Herculis, Galium uniflorum*, etc. But the most interesting species are those southern types which we do not know in Princess Anne and Norfolk Counties but which are in Northampton or Accomac County to the north. To this series belong the following: *Najas guadalupensis* (but extending locally to Massachusetts), *Wolffia punctata* (first in the East north of Florida), *Baptisia alba* (stations discovered by Dr. Robert Tatnall), a new variety of *Cassia nictitans* (otherwise known only near Elizabeth City, North Carolina), *Polygala lutea* (common *west* of Norfolk County), *Ludwigia palustris* var. *nana* Fern. & Grisc. (the first north of Georgia, but subsequently found to be common *west* of Norfolk County), *Utricularia virgatula* Barnh. (locally north to Long Island), *Aster concolor* (locally north to Martha's Vineyard), *Solidago ludoviciana* (Gray) Small (frequent west of Norfolk County and in southern New Jersey), and *S. tortifolia*, common (one station in Princess Anne County). Extensions southward were also noted, particularly of *Cyperus Engelmanni* (first south of New York), abundant in close proximity to *Wolffia punctata* at its northern limit in the Atlantic States. Another plant of extraordinary interest was *Carex arenaria.* Ordinarily ranked as a casual and non-persistent introduction in America, *Carex arenaria* forms, from Savage Point to Kiptopeke (or at least in both areas) an apparently indigenous element in the sand-dune vegetation, forming a turf near the crests of wooded dunes or in the shade of the dwarfed pines. It appeared as native as the strictly endemic plants with which it grows and did not seem to us to have the aggressive and non-fastidious habits of successful modern introductions. Leaving Eastville with the usual regret that we had failed to visit many areas which would have yielded additional novelties, we closed the field work for 1935 and the detailed study of the collections began.

In the following notes I have followed the procedure of the last paper on Virginia, of recording such species and stations as seem to be significant in the working out of a fuller knowledge of the flora of the state. Although primarily a record of collections made in 1935, note is made of earlier or later collections in a few cases. The names of species newly recorded (or seemingly so) from the state are preceded by an asterisk.

In some cases revisions of groups suggested by the work on our plants have been included. In many cases illustration has seemed important to clarify the discussions. The photographs have been made by E. C. Ogden, the cost covered largely by a grant from the Milton Fund for Research, in part by an appropriation from the Wyeth Fund of the Division of Biology, both of Harvard University. The drawings of *Malaxis* were made by Ruth Peabody Rossbach. The large expense of reproducing the photographs has been most generously met by my companion on most of the trips and the modest discoverer of most of the specialties, Bayard Long.

Enumeration of Noteworthy Species Collected[1]

Lycopodium alopecuroides L. Apparently very local in eastern Virginia, not collected by Kearney or by Grimes. Elizabeth City County: peaty depressions in woods and bushy clearings west of Hampton, *F. L. & F.*, no. 4738. Prince George County: sphagnous boggy swale southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 5969.

Lycopodium inundatum L.

So far as is shown in the Gray Herbarium *L. inundatum* is represented in the Coastal Plain of Virginia only by vars. adpressum Chapm. and Bigelovii Tuckerm. The two have been much confused. In general var. *adpressum* has the mature strobiles only 3–6 mm. thick, with tightly appressed sporophylls; var. *Bigelovii* having strobiles 5–13 mm. thick, with loosely ascending to finally spreading sporophylls. The two definitely merge and var. *Bigelovii* clearly passes northward into typical *L. inundatum*. The Virginia collections before me are as follows.

Var. adpressum Chapm. Arlington County: clay pit, near Rosslyn, *Blake*, no. 8936 (as *L. adpressum*). Northampton County:

[1] To save space the collectors are indicated (except in formal descriptions and revisions) by initials: *F. & G.* (*Fernald & Griscom*); *F. G. & L.* (*Fernald, Griscom & Long*); *F. & L.* (*Fernald & Long*); *F. L. & F.* (*Fernald, Long & Fogg*); *F. L. & S.* (*Fernald, Long & Smart* in June and October, 1936).

moist depressions in sand dunes, Savage Neck, *F. L. & F.*, no. 5172 (as var. *Bigelovii*). JAMES CITY COUNTY: moist ditch, northwest of Williamsburg, *Grimes*, no. 3908 (as var. *Bigelovii*). DINWIDDIE COUNTY: boggy woods near head of Old Town Creek, southwest of Petersburg, *F. & L.*, no. 5968. SUSSEX COUNTY: sandy and peaty depression, about 4 miles northwest of Homeville, *F. & L.*, no. 5967; spring-fed wooded sphagnous bog, Coddyshore, *F. L. & S.*, no. 6753. PRINCESS ANNE COUNTY: shallow water, Cape Henry, *L. F. & F. R. Randolph* (as *L. alopecuroides*); damp sandy flats back of the dunes, Rifle Range, *F. & L.*, no. 3616 (as var. *Bigelovii*).

Var. BIGELOVII Tuckerm. ARLINGTON COUNTY: clay pit, near Rosslyn, *Blake*, no. 8937 (as *L. alopecuroides*). SUSSEX COUNTY: sandy and peaty depression, about 4 miles northwest of Homeville, *F. & L.*, no. 5966. PRINCESS ANNE COUNTY: wet peaty depressions in sandy pineland, the Desert, Cape Henry, *F. & L.*, no. 3615.

SELAGINELLA APODA (L.) Fern. Not collected by either Kearney or Grimes. Frequent in the eastern counties, chiefly in rich woods and sandy alluvium; numerous collections.

PINUS VIRGINIANA Mill. Not noted by Kearney; rare in the two southeastern counties but frequent on the Eastern Shore and in the region from Nansemond County westward. PRINCESS ANNE COUNTY: a small stand in dry woods at the tip of Little Neck, *F. & L.*, no. 4740.

*SPARGANIUM ANDROCLADUM (Engelm.) Morong (*S. lucidum* Fern. & Eames). See Fernald, RHODORA, xxiv. 27 (1922). PRINCESS ANNE COUNTY: shallow water, northwest branch of Salt Pond, *L. F. & F. R. Randolph*, no. 468 (as *S. americanum*); swale back of the dunes, Sand Bridge, *F. G. & L.*, no. 4531.

Range extended south from Pennsylvania. Earlier records (Kearney, etc.) of *S. androcladum* belong to the branched state of *S. americanum* Nutt.

NAJAS GUADALUPENSIS (Spreng.) Morong. NORTHAMPTON COUNTY: sandy margin of the largest pond in the woods back of the dunes, Savage Neck, *F. L. & F.*, no. 5174.

RUPPIA MARITIMA L., var. LONGIPES Hagstrom. Not recorded by Kearney. PRINCESS ANNE COUNTY: fresh to slightly brackish water of Back Bay, off north end of Knott's Island, July 23, 1918, *R. M. Harper;* Back Bay, off Cedar Island, *F. G. & L.*, no. 4532.

POTAMOGETON PECTINATUS L. Not recorded by Kearney. Abundant in fresh to slightly brackish water of Back Bay, July 23, 1918, *R. M. Harper*, also 1935, *F. G. & L.*, no. 4533.

P. PULCHER Tuckerm. PRINCESS ANNE COUNTY: brook entering Nowney Creek, Back Bay, *F. G. & L.*, no. 4535. NORFOLK COUNTY: in a stream near Cornland, *F. & G.*, no. 4295.

Although *Potamogeton pulcher* is not listed by Kearney, it is probable that his *P. lonchites* from the Dismal Swamp belongs here. The species is frequent west of the Dismal Swamp.

Triglochin striata Ruiz & Pavon. Princess Anne County: muddy banks and open spots in swales along North Landing River, near Creed's, *F. L. & F.*, no. 4741.

Although known locally in Delaware, and reported from Virginia (by Buchenau), ours is the first material in the Gray Herbarium from between Delaware and Florida, except a sheet of Canby's which might have come from anywhere between Delaware and Cape Charles. Not noted by Kearney.

Sagittaria latifolia Willd., var. pubescens (Muhl.) J. G. Sm. Princess Anne County: open swamp near Oceana, *F. & L.*, no. 4743.

Not recorded by Kearney and surely local in the two southeastern counties; frequent in the counties west of the Dismal Swamp.

*Limnobium Spongia (Bosc) Richard. Princess Anne County: in water of cove, southern end of Lake Joyce, *F. & G.*, no. 4296 (young foliage, in May, floating, the blades conspicuously inflated beneath), *F. L. & F.*, no.. 4744 (flowering and fruiting, in September, the newer leaves erect and without inflation).

First material in the Gray Herbarium from between Georgia and Delaware. I find no record from Virginia.

Vallisneria americana Michx. Princess Anne County: small plants drifted ashore, southern end of Lake Joyce, *F. L. & F.*, no. 4745.

Not recorded by Kearney.

Eragrostis hirsuta (Michx.) Nees. Recorded as common in Princess Anne and Norfolk Counties in Rhodora, xxxvii. 134 (1935). Also common in Northampton County: Eastville, *F. & L.*, no. 5219; Kiptopeke, *F. L. & F.*, no. 5220.

Uniola paniculata L. Northampton County: sandy beach of Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5221.

Hitchcock (Man. 180) states the northern limit as Cape Henry.

U. sessiliflora Poir. To Grimes's station in James City County add Princess Anne County: rich dry woods, Great Neck, *F. G. & L.*, no. 4559, *F. & L.*, no. 4799. Southampton County: rich woods, southeast of Ivor, *F. & L.*, no. 6777.

Kearney recorded it (as *Uniola longifolia*) from Virginia Beach.

Melica mutica Walt. Princess Anne County: rich woods, Cedar Island, *F. G. & L.*, no. 4560.

A notable colony, in the low woods of Cedar Island in Back Bay, at the outer margin of the Coastal Plain. The habitat given by Hitchcock (Man. 203) is "Rocky woods." Cedar Island is fully 85 miles east of the Fall Line in Greensville County, where the nearest

"rocks" are found. Virginia Beach, Kearney's station, is likewise on the outer margin of the state.

TRIODIA FLAVA (L.) Hitchc., var. CHAPMANI (Small) Fern. & Grisc. in RHODORA, xxxvii. 133 (1935). To the station recorded at Cape Henry add NANSEMOND COUNTY: dry sandy woods along Pitch Kettle Creek, north of Lake Kilby, *F. L. & F.*, no. 4795; dry sandy woods, Factory Hill, *F. & L.*, no. 6518.

ELYMUS VILLOSUS Muhl. (*E. striatus* of Am auth., not Willd.). See Fernald, RHODORA, xxxv. 193 (1933). PRINCESS ANNE COUNTY: rich woods, Cedar Island, *F. G. & L.*, no. 4554.

Extraordinarily large (1.2 m. high), with leaves 1 cm. broad and inflorescences 1.5 dm. long; a species of rich woods of the interior, here at the outer margin of the Coastal Plain. Not listed by Kearney.

AGROSTIS ELATA (Pursh) Trin. For discussion of specific characters see Fernald, RHODORA, xxxv. 211 (1933). NORTHAMPTON COUNTY: peaty clearing, south of Townsend, *F. L. & F.*, no. 5212.

ARISTIDA PURPURASCENS Poir., var. MINOR Vasey. For discussion of characters see Fernald & Griscom, RHODORA, xxxvii. 136 (1935). NORTHAMPTON COUNTY: dry sandy pine woods, Eastville, *F. & L.*, no. 5210.

Extension north from Norfolk County.

PHALARIS CAROLINIANA Walt. PRINCESS ANNE COUNTY: border of brackish marsh, Cedar Island, *F. G. & L.*, no. 4547.

Not recorded by Kearney.

THE VARIETIES OF LEERSIA VIRGINICA (PLATE 440, all FIGS. × 10). In Princess Anne County *Leersia virginica* Willd. is represented by two quite dissimilar plants. One, a delicate plant of damp rich woodlands and their bordering ditches, has the whitish-green spikelets (FIGS. 1 and 2) very minutely and remotely setulose-puberulent, with margins smooth or at most very short-ciliolate; the other, a coarser plant of river-swales, almost as coarse as *L. oryzoides* (L.) Swartz, has the spikelets (FIG. 9) greener, rather larger, with more prominent ribbing and a positive ciliation of elongate hairs or bristles.

Study of a large series of material shows that *L. virginica* throughout much of its range breaks into the two variations which we noted in Virginia. The size of plant, breadth of leaf and size of spikelet vary in both, but one series (FIGS. 1–8) has the spikelets with smooth or barely ciliolate margins, the other (FIGS. 9–13) has the margins coarsely ciliate-hispid. In view of this strong divergence it is important to know which extreme formed the basis of *L. virginica* Willd. Sp. Pl. i. 325 (1797). It is also necessary to identify the type

of *L. imbricata* Poir. in Lam. Encyc. Suppl. iii. 329 (1813). Fortunately this is quickly possible, through the fact that on his last trip to Europe, in 1935, the late Professor A. S. Hitchcock secured fragments for the National Herbarium from each of them. These have been most generously loaned me by Mrs. Agnes Chase. Figs. 3 and 4 shows spikelets from the type of *L. virginica* at Berlin, × 10, fig. 5 those of the type of *L. imbricata* at Paris, × 10. That they are both the extreme with essentially smooth-margined spikelets is evident. Fig. 6 shows spikelets (unusually large) of typical *L. virginica* from near Montreal (*Victorin*, no. 24,361); fig. 7 from New York (Vaughans, Aug. 4, 1897, *Burnham*); figs. 1 and 2 from Virginia (*Fernald & Long*, no. 4781) and fig. 8 from Illinois (Peoria, August, 1903, *McDonald*). Mrs. Chase informs me that "*Leersia ovata* Poir., which has been referred to *L. lenticularis*, is *L. virginica* with cilia on the lemma about 0.5 mm. long." The extreme plant with bristly-ciliate spikelets should, therefore, be called

*Leersia virginica Willd., var. **ovata** (Poir.), comb. nov. *L. ovata* Poir. in Lam. Encycl. Supp. iii. 329 (1813).

Fig. 9 shows the spikelets of var. *ovata* from North Landing River, Virginia, *Fernald, Long & Fogg*, no. 4782; fig. 10 from Ithaca, New York, *Metcalf*, no. 1576; fig. 11 from Lancaster Co., Pennsylvania, *Heller*, no. 4796; fig. 13 from Fort Snelling, Minnesota, *Mearns*, no. 770; and fig. 12 from Apalachicola, Florida, *Chapman*.

Digitaria filiformis (L.) Koeler, var. villosa (Walt.) Fern. in Rhodora, xxxvi. 19 (1934). Northampton County: crest of sandy and argillaceous bluff along Chesapeake Bay, Old Town Neck, *F. L. & F.* no. 5193. Nansemond County: dry sandy bank along Pitch Kettle Creek, north of Lake Kilby, *F. L. & F.*, no. 4759.

Not listed by Kearney.

Axonopus furcatus (Flügge) Hitchc. Northampton County: moist peaty depression in pine woods south of Townsend, *F. L. & F.*, no. 5207; Southampton County: open sandy borders of pools and depressions in bottomland of Nottoway River, Courtland, *F. & L.*, no. 6470.

Extensions north and west from Princess Anne County.

Paspalum setaceum Michx., var. supinum (Bosc) Trin. (*P. supinum* Bosc). See Fernald, Rhodora, xxxvii. 390 (1935). Northampton County: dry sandy pine woods, Eastville, *F. & L.*, no. 5192.

Extension north from Cape Henry.

P. dilatatum Poir. Northampton County: dry sandy and

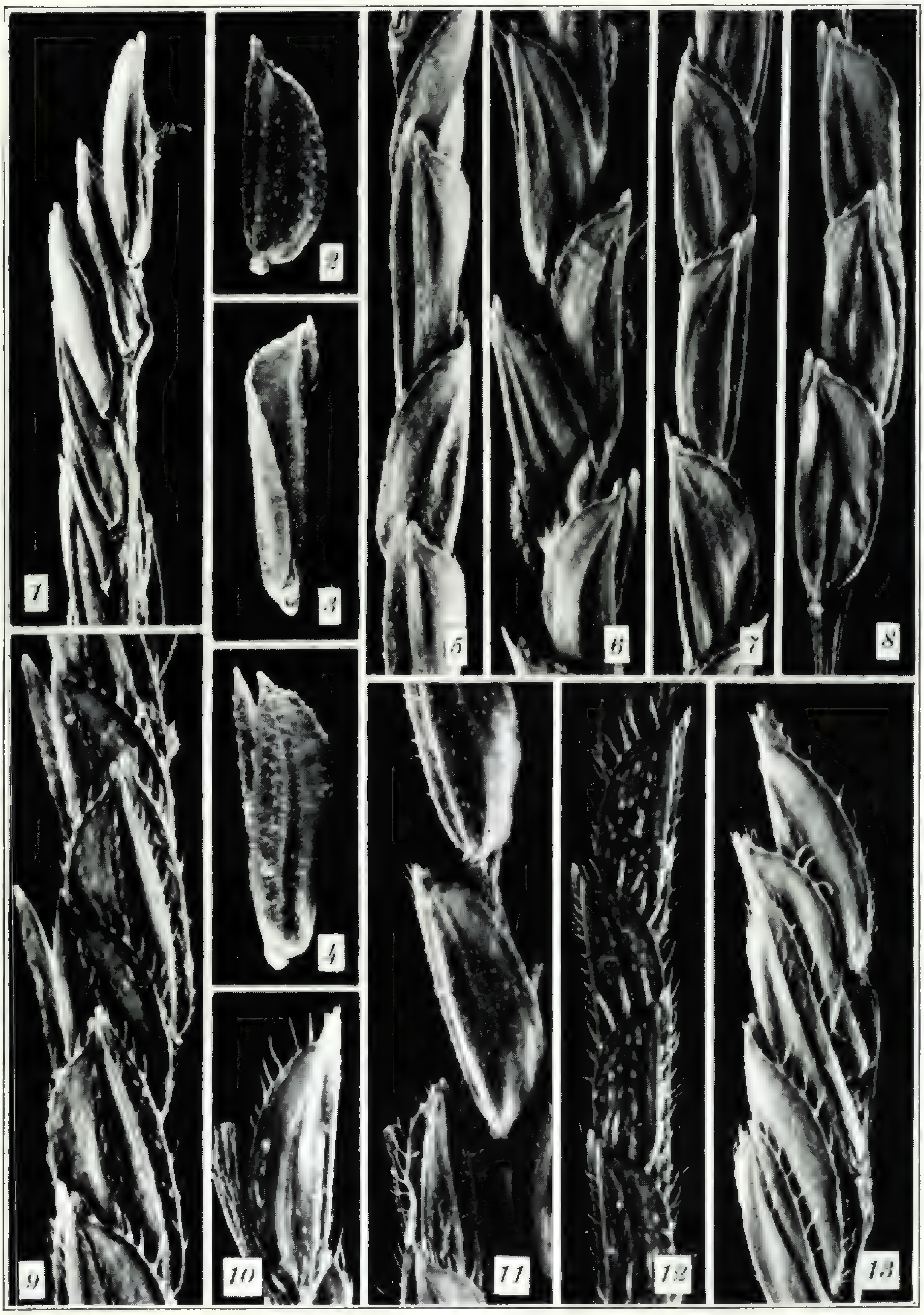

Photo. E. C. Ogden.

Spikelets of Leersia virginica, × 10. Figs. 1–8, typical L. virginica; figs. 3 and 4, from type of the species; fig. 5, from type of L. imbricata. Figs. 9–13, var. ovata.

Photo. E. C. Ogden.

Fig. 1. Panicum dichotomiflorum; fig. 2, var. geniculatum; both × ⅖.

argillaceous pine woods back of the shore-bluff, west of Kiptopeke, *F. L. & F.*, no. 5191; grassy roadside, Eastville, *F. & L.*, no. 5190.

Slight northern extension. Although Mrs. Chase, N. Am. Sp. Pasp. (Contrib. U. S. Nat. Herb. xxviii.), 172, extends the range north to New Jersey, the extension is based only on material from waste land in Camden in 1882, where the plant was not indigenous nor persistent.

P. Boscianum Flügge. Princess Anne County: wet, argillaceous thickets and ditches, Rosemont, *F. & L.*, no. 4756. Southampton County: sandy alluvium, bottomland of Blackwater River, near Oak Grove School, *F. & L.*, no. 6462. Nansemond County: roadside ditch, Factory Hill, *F. & L.*, no. 6765.

Recorded by Mrs. Chase only from Norfolk County and the Dismal Swamp. The colloquial name "Bull Grass," coupled with the specific name and that of its author, ameliorates the tediousness of an often dry subject.

Panicum dichotomiflorum Michx., var. **geniculatum** (Wood), comb. nov. Plate 441, fig. 2. *P. miliaceum ?* Walt. Fl. Carol. 72 (1788), not L. (1753). *P. geniculatum* Ell. Sk. i. 117 (1816), as to plant described, not Muhl. (1813). *P. retrofractum* Delile in Desv. Opusc. 96 (1831). *P. proliferum*, β. *geniculatum* Wood, Am. Bot. Fl. ed. of 1873: 392 (1873).

Even after the segregation of the hispid-sheathed and coarse Floridan and Bahaman var. *bartowense*[1] and the slender and small-flowered northern var. *puritanorum* Svenson in Rhodora, xxii. 154, figs. 1–5 (1920), *Panicum dichotomiflorum* Michx. consists of two very distinct but usually unrecognized geographic varieties in temperate North America. In New England and much of the coastwise region, extending locally into the interior, the common plant (no. 1, our fig. 2) when well developed, has a coarse and geniculate stem, with enlarged lower nodes, inflated lower and primary sheaths, panicles eventually borne at most of the nodes, the peduncle included in the sheath or only short-exserted, the stiffish branches of the panicle soon horizontally divergent to finally reflexed, the spikelets rather crowded. Just appearing in New England, as a weed of railroad yards and roadsides, apparently coming from the West, is a very different plant (no. 2, our fig. 1): more slender, less geniculate, the culms more ascending, with sheaths little if at all inflated, the nodes less enlarged, the terminal panicles becoming long-exserted

[1] Panicum dichotomiflorum Michx., var. **bartowense** (Scribn. & Merr.), comb. nov. *P. bartowense* Scribn. & Merr. in U. S. Dept. Agric. Div. Agrost. Circ. xxxv. 3 (1901).

(0.5–2 dm.), their capillary branches all ascending at maturity (not divergent or reflexed) and with fewer and less crowded spikelets; the aspect of the plant being that of *P. capillare* L. As represented in the Gray Herbarium, no. 2 is rare in southern New England and New York; the other specimens are from Pennsylvania, District of Columbia, West Virginia, western Virginia and our recent collection from eastern Virginia (wet argillaceous thickets and ditches, Rosemont, no. 4761), western North and South Carolina, interior Georgia, northern Florida, southern Ontario, Indiana, Kentucky, Tennessee, Illinois, Iowa, Missouri, Arkansas, Louisiana, Kansas, Oklahoma, Texas and California; generally an inland range. No. 1, on the other hand, is the commoner coastwise plant of the East: Nova Scotia, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, Ohio, Mississippi, Illinois, Iowa, Missouri, Louisiana and Oklahoma. Being weeds, either of them is likely to spread, but the greater abundance of no. 1 in the coastal states is clear.

Panicum dichotomiflorum of Michaux, Fl. Bor.-Am. i. 48 (1803) was no. 2 of this discussion:

> DICHOTOMIFLORUM. P. erectum, glabrum: panicula ramos alternos culmumque terminate, dichotome (*absque rachi commune*) ramosissima; ramis prolixis, setaceis: floribus oblongis, acuminatis.
> *OBS.* Habitus fere *P. capillaris.*
> *HAB.* in occidentalibus montium *Alleghanis.*

In 1788, Walter mistook our no. 1 for *Panicum miliaceum* L., the Old World annual:

> miliaceum? 7. Panicula patente, culmo ramoso geniculato decumbente, staminibus flavis, pistillis purpureis,

the patent panicle and geniculate habit as well as the region (eastern South Carolina) making this apparent. Muhlenberg caught the second character and published the name *P. geniculatum* Muhl. Cat. 8 (1813) as a substitute for *P. dichotomiflorum* Michx., excluding Michaux's habitat and giving only "Pens. . . . Car. Georg." That Muhlenberg probably had our plant no. 1 is evident but nomenclaturally his *P. geniculatum* must rest on *P. dichotomiflorum* (our no. 2). In 1816, Elliott beautifully described as *P. geniculatum* the

common coastwise plant, ascribing the name to Muhl. Cat. but giving a clear interpretation of the synonymy: "P. dichotomiflorum? Mich. 1. p. 48. P. miliaceum, Walt. p. 72." Elliott's "culmo assurgenti, geniculato . . ; paniculis terminalibus, axillaribusque, diffusis, patentibus; vaginis foliorum inflatis" are unequivocal; but, unfortunately, he called his beautifully characterized plant *P. geniculatum* Muhl., which, as already shown, was a substitute-name for *P. dichotomiflorum.* Delile's *P. retrofractum,* too, the type from Carolina, was the same as the plants of Walter and of Elliott; his "panicula laxa: ramis retroflexis divaricatis apice floriferis" makes that clear.

The first varietal name for our no. 1, the plant described by Walter as *Panicum miliaceum,* by Elliott as *P. geniculatum,* and by Delile as *P. retrofractum,* is the name published by Alphonso Wood in 1873: *P. proliferum,*

β. **geniculàtum.** Culm thick, geniculate below; pan. dense. Marshes.

Used in this rank, var. *geniculatum* is correct, for it is the first varietal name published for the plant. Wood did not mention Muhlenberg nor Elliott; therefore his name cannot be taken as based upon *Panicum geniculatum,* Muhlenberg's substitute for typical *P. dichotomiflorum.* If Wood had cited Muhlenberg the case would be different and there would then be justification for the assumption of Hitchcock & Chase: "This is probably based on *P. geniculatum* Ell., though that name is not mentioned."[1] When, in 1788, Walter described our plant, he called it *P.* "*miliaceum?*", the mark of interrogation indicating that he was doubtfully identifying it with the already published *P. miliaceum* L. In this instance, with no author cited, Hitchcock & Chase made a singular reversal in their reasoning: "Since Walter does not give Linnaeus as authority nor use his diagnosis, this is evidently intended as a new species."[2] Walter gave no authorities for the species in his *Flora Caroliniana;* but the new species were indicated by italics, the old ones not. Thus, under *Panicum* Walter had the following Linnean names, all properly indicated by typography as not new, though with new diagnoses: *alopecuroideum, italicum, hirtellum, dimidiatum, capillare, miliaceum?, latifolium* and *brevifolium.* Even though Walter misinterpreted the Linnean names in some cases, the fact remains that he was clearly differentiating between the old and the wholly new names.

[1] Hitchc. & Chase, Contr. U. S. Nat. Herb. xv. 49 (1910).
[2] Hitchc. & Chase, l. c. 48.

Although Hitchcock & Chase cite in the synonymy of their all-inclusive *Panicum dichotomiflorum* some varietal names older than that of Wood, only one might be thought identical with var. *geniculatum*. This is *P. chloroticum* Nees, var. *agreste* Nees in Trin. Gram. Pan. 236 (1826) from Brazil; but the Brazilian material shows that this has the upper leaves more evenly linear nearly to the short tip, var. *geniculatum* having them long-attenuate.

P. PHILADELPHICUM Bernh. PRINCESS ANNE COUNTY: dry argillaceous fields and bushy clearings, Rosemont, *F. & L.*, no. 4760. NANSEMOND COUNTY: sandy wood-road, Factory Hill, *F. & L.*, no. 6472.

Not collected by Kearney or the Grimes's.

P. AMARULUM Hitchcock & Chase. NORTHAMPTON COUNTY: sandy beach of Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5196.

Not cited by Hitchcock and Chase from the Eastern Shore.

*P. AGROSTOIDES Spreng. PRINCESS ANNE COUNTY: argillaceous ditches at borders of woods south of Virginia Beach, *F. & L.*, no 4768.

Not recorded by Hitchcock & Chase nor by Hitchcock (Man.) from Virginia. Our material is transitional to the next.

*PANICUM AGROSTOIDES Spreng., var. **ramosius** (Mohr), comb. nov. *P. elongatum ramosior* Mohr, Contrib. U. S. Nat. Herb. vi. 357 (1901). PLATE 442, FIGS. 4–6.

The plant (FIGS. 4–6) of bottomlands and alluvium of wooded swamps from Nansemond County at least to Southampton and Greensville Counties, Virginia, scarcely suggests the typical northern *Panicum agrostoides* (FIGS. 1–3). The latter, typified by Hitchcock and Chase by a specimen from Pennsylvania, has the culms strongly compressed, 2–9 dm. high, with pale nodes, the sheaths often longer than the internodes, the blades firm; the terminal panicles 0.8–2.5 dm. long, their branches and branchlets densely floriferous with crowded purple to bronze ellipsoid, acute to short-acuminate spikelets (FIG. 2) 1.7–2.2 mm. long and 0.8–1 mm. in diameter. The fruits are barely stalked (FIG. 3). This plant occurs in typical form from central Maine to western New York and Maryland, more locally to North Carolina and Missouri.

Most of the material from the Mississippi and the adjacent drainages and from the southern and southeastern Coastal Plain is like the plant which we met in the valleys of the Blackwater, Nottoway and Meherrin in southeastern Virginia. In this Coastal Plain-Mississippi Basin plant the culms are less compressed, 0.5–1.5 m. high, with dark

mostly exserted nodes, the leaf-blades membranaceous, the panicles green to drab or lead-color (only when exposed to strong light slightly purple), the terminal ones 1.5–4 dm. long, their branches and branchlets loosely floriferous with green to lead-colored (rarely purple) lanceolate to lance-ovoid attenuate or slender-tipped spikelets (FIGS. 4 and 5) of the same length as in typical *P. agrostoides* but more slender (0.5–0.8 mm.) in diameter. The fruits (FIG. 6) are slightly more slender, approaching those of *P. stipitatum* but even shorter-stiped than in the northern plant. That this is the plant which Mohr had there can be no question. His characterization was perfect:

Stem stouter and taller than in the type, fully 3 feet long, reclining, smooth leaves, 2 feet and over in length, sheaths shorter than the internodes; panicle large, widely spreading, pyramidal, 12 to 18 inches long; lower branches 4 to 5 inches long; secondary branches rather distant, mostly in pairs; spikelets as in the type, pale. By these permanent characters a well marked variety.

That Mohr associated his variety with *P. elongatum* Pursh, not Salisb. (*P. stipitatum* Nash) seems natural. Its slender-tipped and comparatively elongate spikelets, often subsecund along the branchlets, suggest that species; but *P. agrostoides* var. *ramosius* has the barely stipitate fruits and the smooth or smoothish leaf-surfaces of *P. agrostoides*, the quite definite *P. stipitatum* (FIGS. 7–9) having harsh and subrigid leaves, very stiff and contracted panicles with stiffly divergent branchlets of subsecund slender spikelets, and the fruits (FIG. 9) very definitely stipitate.

Hitchcock & Chase were conscious to some degree of *Panicum agrostoides* var. *ramosius* but they did not clearly differentiate it. Their comments in their discussion of *P. agrostoides* apply to it. Referring to some specimens from Georgia, Florida and Texas they said: "In the following specimens the spikelets are more or less secund on the branchlets, giving the panicles much the aspect of those of *P. stipitatum*, . . . "; again, discussing other specimens from Georgia, Florida and Alabama (Mohr's type) they referred to them as "Unusually loosely flowered, open-panicled specimens, such as that named *P. elongatum*, var. *ramosius*."

So different are these plants of the southern Coastal Plain and of the Mississippi Basin from typical northern *Panicum agrostoides* that they seem to me a strongly defined variety. In order to make clear the characters of the plants discussed I have asked Mr. Ogden to display their essential characters in PLATE 442.

The following collections from Virginia belong to Panicum agrostoides, var. ramosius. Greensville County: sandy alluvium, bottomlands of Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6473. Southampton County: sandy, wooded bottomland of Nottoway River, Courtland, *F. & L.*, no. 6474; sandy alluvium, bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, *F. & L.*, no. 5990; sandy alluvium, wooded bottomland of Blackwater River, southeast of Ivor, *F. & L.*, no. 5992. Isle of Wight County: sandy alluvium, wooded bottomland of Blackwater River, Zuni, *F. & L.*, no. 5991. Nansemond County: sandy wood-road, Factory Hill, *F. & L.*, no. 6475.

P. anceps Michx., var. rhizomatum (Hitchc. & Chase) Fern. in Rhodora, xxxvi. 73 (1934). Northampton County: dry pine woods near Capeville, *F. L. & F.*, no. 5195.

Extension north from Cape Henry.

P. villosissimum Nash, var. pseudopubescens (Nash) Fern. in Rhodora, xxxvi. 79 (1934). Nansemond County: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4773. Dinwiddie County: border of dry sandy woods near Carson, *F. L. & S.*, no. 5616.

Not recorded by Hitchcock & Chase from the state.

*Panicum (sub–§ Scoparia) **mundum**, sp. nov. (tab. 443, figs. 1–5), planta dense cespitosa 0.5–1.4 m. alta; culmis firmis basi 0.7–3 mm. diametro; internodiis elongatis 6–15, imis villosis, villis cinereis adscendenti-patentibus ad 2 mm. longis, internodiis superioribus cinereo-puberulis vel breviter pilosis vel glabratis; nodis valde divergenter barbatis; foliis rosulatis basilaribus late lanceolatis firmis glabris 2–4 cm. longis 8–15 mm. latis 45–60-nerviis; foliis caulinis primariis 6–15 anguste lanceolatis firmis glabris 6–15 cm. longis 8–13 mm. latis, basi rotundatis ciliatis ciliis basi bullatis, apice attenuatis, vaginis glabris vel papillato-bullatis margine apiceque ciliatis, ligulis densis ad 1 mm. longis; paniculis primariis deinde exsertis ellipsoideo-ovoideis 7–12 cm. longis 5–10 cm. diametro, rhachi patenter piloso vel glabratis, ramibus adscendentibus, pedicellis elongatis glabris; spiculis pubescentibus subgloboso-obovoideis vel -ellipsoideis apice rotundatis vel obtusis 1.8–2.2 mm. longis 1–1.2 mm. diametro, gluma inferiore deltoideo-ovata subacuta 0.4–0.6 mm. longa, superiore lemmateque sterili aequilongis valde costatis fructus lucidos paullo superantibus; statu autumnali sparse ramoso, ramibus adscendentibus, paniculis terminalibus 1–6 cm. longis.—Sussex and Princess Anne Counties, Virginia: (Sussex Co.) peaty clearing at border of cypress (*Taxodium*) swamp, 4 miles northwest of Homeville, July 20, 1936, *Fernald & Long*, no. 6017, August 25, 1936, *Fernald & Long*, no. 6499 (type in Gray Herb., isotypes in Herbs. Phil. Acad., Univ. Richmond and elsewhere); (Princess Anne Co.) sandy and peaty meadows, Rifle Range, south of Rudy Inlet, and peaty meadows south of Dam Neck, June 16, 1935, *Fernald, Griscom & Long*, nos. 4542, 4541 (distributed as *P. nitidum*).

Panicum, subgen. *Dichanthelium*, sub- § *Scoparia* consists of a few species with tall culms and with numerous nodes and primary leaves. Besides the usually common and widely dispersed *P. scoparium* Lam., it has been recognized as having only three local species: *P. scabriusculum* Ell., one of the very local plants of the Coastal Plain; *P. aculeatum* Hitchc. & Chase, one of the rarest members of the genus; and *P. cryptanthum* Ashe, whose half-dozen or so restricted stations are scattered from Texas to southern New Jersey. It is, therefore, to be expected that other highly localized "relic" species of the subsection are hidden in favorable habitats on the Coastal Plain.

Panicum mundum is one of the neatest and most definite of species. At once distinguished from the coarser and common *P. scoparium* by its glabrous foliage, small and plump spikelets and sparsely branching habit, it finds its nearest relationship with *P. aculeatum* and *P. cryptanthum*. From them both it is at once distinguished by its copiously pubescent culms (FIG. 3), heavily bearded nodes (FIG. 3) and small round-topped to barely acute, pubescent, obovoid or thick-ellipsoid spikelets (FIG. 5); the other two species having the acute spikelets decidedly more slender and longer, in *P. aculeatum* 3 mm. long and pubescent (FIG. 7), in *P. cryptanthum* 2.2–2.4 mm. long and glabrous (FIG. 6).

The type of *Panicum mundum* comes from an area with many strikingly localized plants. Mr. Long and I had spent some time in a peaty depression where occur many species hitherto unknown or but rarely found in Virginia (*Panicum hemitomon* Schultes, *P. Wrightianum* Scribn., *Leersia hexandra* Swartz, *Rynchospora caduca* Ell., *R. n. sp.* (to be described in a later paper), *Scleria Elliottii* Chapm., *Drosera capillaris* Poir., *Hypericum denticulatum* Walt. var. *ovalifolium* (Britton) Blake, *Sabatia campanulata* (L.) Torr., *Hydrolea quadrivalvis* Walt., etc.). Finally, realizing that our intended destination was far ahead, we were about to start southward, when we noted that, across the road, the boggy area merged into the remnant of a cypress swamp. Anxious to get started, I somewhat impatiently awaited my companion, who had "poked into" the cypress thicket, but he soon returned with the first collection of the astonishing *Panicum*. A month later I personally collected a series of the autumnal state from a different stool of the species.

The two numbers from Princess Anne County (Rifle Range and Dam Neck), both young, greatly puzzled us when they were collected.

In 1935, not feeling competent to propose a new species in *Panicum*, subgen. *Dichanthelium,* I tried to avoid the inevitable by forcing them into the very different *P. nitidum* Lam. Now that another colony, sixty or seventy miles to the west, has been found and the plant collected in full anthesis and in its autumnal state, the essential similarity to it of the coarse plant of Princess Anne is apparent. From *P. nitidum* the new species is strikingly different in its coarser and much taller culms copiously pubescent on the lower internodes (in the slender *P. nitidum* glabrous), in the great number of primary leaves and internodes, in its more pubescent and plumper spikelets, and in its very sparsely and stiffly branched autumnal state, the autumnal state of *P. nitidum* being as densely and intricately branched as in *P. microcarpon* Muhl. or as in *P. dichotomum* L. As in *P. nitidum,* the sheaths of *P. mundum* are often conspicuously viscid-spotted. The great number of primary leaves in the better developed plants and the strong pubescence of *P. mundum* seem to place it in subsection *Scoparia*. In other traits and through the less developed individuals it approaches subsection *Dichotoma*.

In the Princess Anne area, just as in the type-locality, *Panicum mundum* is also a member of a strikingly localized flora. The swales, sands, peats and ponds of Dam Neck and the Rifle Range are essentially confluent. They are the home of usually limited colonies of such plants (rare or local in Virginia) as *Axonopus furcatus* (Flügge) Hitchc., *Eleocharis ambigens* Fern., *Rynchospora fascicularis* (Michx.) Vahl and *R. Wrightiana* Boeckl., *Juncus Elliottii* Chapm., the endemic *Hypoxis Longii* Fern., the excessively rare *H. sessilis* L., *Viola pectinata* Bickn., *Hydrocotyle Canbyi* C. & R., *Gentiana parvifolia* (Chapm.) Britton., *Asclepias lanceolata* Walt. var. *paupercula* (Michx.) Fern. and *Erigeron vernus* (L.) T. & G.

Sacciolepis striata (L.) Nash. Princess Anne County: swales back of the dunes, Rifle Range, *F. & L.*, no. 4264; open clay of fields and thickets, Virginia Beach, *F. G. & L.*, no. 4546; fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4775.

Mature culms very brittle.

Setaria magna Griseb. Princess Anne County: border of salt marsh, arm of Lynnhaven Bay at Third Street Bridge, Great Neck, *F. & L.*, no. 4777; fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4778.

At both stations in recently disturbed soil, suggesting recent introduction. Not noted by Kearney.

Photo. E. C. Ogden.

Panicum agrostoides: fig. 1, portion of panicle, × 1; fig. 2, spikelets, × 10; fig. 3, fruit, × 20.

P. agrostoides, var. ramosius: fig. 4, portion of panicle, × 1; fig. 5, spikelets, × 10; fig. 6, fruit, × 20.

P. stipitatum: fig. 7, portion of panicle, × 1; fig. 8, spikelets, × 10; fig. 9, fruit, × 20.

Photo. E. C. Ogden.

Panicum mundum: fig. 1, plant (type), × ⅖; fig. 2, vernal panicle, × 1; fig. 3, lower internode, node and base of sheath, × 10; fig. 4, upper sheath, × 10; fig. 5, three spikelets, × 10.

P. cryptanthum: fig. 6, spikelet, × 10.

P. aculeatum: fig. 7, spikelet, × 10.

*Arthraxon hispidus (Thunb.) Makino, var. cryptantherus (Hackel) Houda. Elizabeth City County: roadside ditches bordering peaty depressions in thin woods and bushy clearings west of Hampton, *F. L. & F.*, no. 4758; seen in a similar habitat a few miles farther north.

The eastern range "Pennsylvania to Florida," given by Hitchcock, Man. Grasses U. S. 725 (1935), needs clarification. This Asiatic plant is represented in the Gray Herbarium from Pennsylvania only by material from the Japanese Garden in the Centennial Grounds of Philadelphia in 1876. Mr. Long informs me that he knows no evidence of it in Pennsylvania except as *cultivated* in the Japanese Garden of 60 years ago!

Andropogon Elliottii Chapm. Elizabeth City County: peaty depression in thin woods and bushy clearings, west of Hampton, *F. L. & F.*, no. 4747—not collected by Grimes. Northampton County: frequent to common.

A. virginicus L., var. tenuispatheus (Nash) Fernald & Griscom in Rhodora, xxxvii. 142 (1935). Extended north from Princess Anne County to Northampton County: peaty clearing south of Townsend, *F. L. & F.*, no. 5181.

*A. virginicus, var. tenuispatheus, forma hirsutior (Hackel) Fernald & Griscom, l. c. Extended north from Georgia to Northampton County: moist peaty depressions in pine woods south of Townsend, *F. L. & F.*, no. 5180.

Cyperus sabulosus Mart. & Schrad. Not collected by Grimes. Elizabeth City County: peaty depressions in thin woods and bushy clearings, west of Hampton, *F. L. & F.*, no. 4809. A frequent weed in Northampton County: Eastville, *F. & L.*, no. 5224.

*C. Iria L. As pointed out by Fernald & Griscom in Rhodora, xxxvii. 147, 148 (1935), the common form of *C. Iria* in southeastern Virginia is var. *Santonici* (Rottb.) Fern. & Grisc. We now have true *C. Iria* from Princess Anne County: clearing in rich dry woods, Little Neck, *F. & L.*, no. 4810.

*C. Engelmanni Steud. Northampton County: sandy border of pond in woods back of the dunes, Savage Neck, *F. L. & F.*, no. 5228.

The first record, apparently, of the species in the coastwise Atlantic States from south of Massachusetts and New York, where it is local and isolated from the Mississippi drainage. The pond where *Cyperus Engelmanni* abounds is one of a group of small ponds with two other extraordinarily local species abounding. See notes on *Wolffia punctata* and *Wolffiella floridana*.

*Eleocharis prolifera Torr. Princess Anne County: forming

continuous turf at the peaty margin of a cove, southern end of Lake Joyce, *F. L. & F.*, no. 4817.

Cited, with doubt, by Kearney from sterile material collected at Cape Henry. The plant seen by us (*F. & L.*, no. 3761) in fruit at Cape Henry was *E. microcarpa* Torr.

*E. flaccida (Reichenb.) Urban, var. olivacea (Torr.) Fern. & Grisc. in Rhodora, xxxvii. 155 (1935). Northampton County: boggy swale bordering swampy woods south of Kendall Grove, *F. L. & F.*, no. 5235. Isle of Wight County: moist depressions in sandy pine barrens south of Zuni, *F. & L.*, no. 6532.

Extension south from New Jersey.

Fuirena hispida Ell. Nansemond County: springy and sandy depressions, Kilby, *F. L. & F.*, no. 4822. Thence frequent west to the Fall Line.

Not listed by Kearney, who notes *F. squarrosa* Michx., a species common in Princess Anne County and on the Eastern Shore but not seen by us to the westward.

Rynchospora corniculata (Lam.) Gray. York County: filling a small depression or "bay," about four miles south of Yorktown.

Examined but not taken, since we did not realize that it is not in Grimes's collection. Occasional in the most southern counties, from Princess Anne westward.

R. cymosa Ell. Elizabeth City County: peaty depressions in thin woods and bushy clearings west of Hampton, *F. L. & F.*, no. 4827; common in the southern counties from Princess Anne to the Fall Line.

Not collected by Grimes.

R. microcephala Britton. See Fernald, Rhodora, xxxvii. 404, 405, t. 391, figs, 4 and 5 (1935). Princess Anne County: fresh to brackish swale along North Landing River, near Creed's, *F. L. & F.*, no. 4830.

Recorded only from Norfolk County, but frequent westward to the Fall Line.

R. inexpansa (Michx.) Vahl. Northampton County: moist peaty depression in pine woods south of Townsend, *F. L. & F.*, no. 5246.

Extension north from Princess Anne County, where it is common, thence west to the Fall Line.

Cladium jamaicense Crantz. To the few recorded stations add Princess Anne County: fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4832.

The three recorded stations (Kearney's at Northwest, Fernald & Long's near Blackwater River, tributary to North Landing River (see RHODORA, xxxvii. 405) and this station near Creed's) are on the estuaries of small rivers entering the northwest head of Curratuck Sound.

SCLERIA TRIGLOMERATA AND ITS ALLIES (PLATE 444).—In south-eastern Virginia the plants with cellular-reticulate 3-angled hypogynium, no tubercles, and lustrous, smooth, white, cream-colored, drab or marbled achenes, occur as three clearly defined species, all of which are reduced outright in Core's treatment[1] to *Scleria triglomerata.* The three occur in close proximity to one another, two of them often closely intermingled in the same habitats. Consequently, if they are mere phases of one species, it is singular that they should be so sharply distinguished by clear morphological characters, without intergrading in the same habitats. Study of the series in the Gray Herbarium shows that the three have several definite characters each and that their broad ranges are quite different, although in the Coastal Plain from New Jersey to North Carolina they all come together.

Without a very critical examination of the type of *Scleria triglomerata* Michx. Fl. Bor.-Am. ii. 168 (1803) it is impossible to say which of the three he had. Upon examining it many years ago Asa Gray made the pencilled memorandum regarding the material: "Very poor." Consequently, its exact identity can presumably be made out only by one very intimately acquainted with minute details of the plants. For the time being I am retaining the name *S. triglomerata* for the coarsest of the three plants (FIGS. 1–4), the species of wide range to which the name has been most generally applied since the monograph of Torrey. *S. nitida* Willd. in Kunth, Enum. ii. 350 (1837), with emphasis given the "rigid" slender leaves and the OVATE-subglobose achenes, is taken up for a Coastal Plain species with these characters. In 1855 Steudel, Syn. Pl. Cyp. 174, described from South Carolina a *S. flaccida.* From his diagnosis alone it might be either of the two above noted. The third species is the excessively slender *S. minor* (Britton) Stone, Rep. N. J. State Mus. for 1910: 283 (1911).

As I understand these three species, they are distinguished as follows.

[1] E. L. Core, Am. Sp. Scleria, Brittonia, ii. 63 (1936).

a. Membranous band on ventral side of leaf-sheath glabrous or nearly so below the sharply separated glabrous to puberulent ligule; rhizome forking, in no. 1 forming a knotty mass.
Plant pale- or yellow-green; culms 2.5–6 mm. thick at base; leaves 5–8 mm. broad, linear and scarcely narrowed up to the short tip, glabrous or the sheaths and midribs beneath pilose; achenes subglobose to oblate, strongly rounded at summit, nearly or quite as broad as long, 2–2.5 mm. high, 2–2.7 mm. broad (FIGS. 1–4)..... 1. S. *triglomerata.*
Plant bluer-green; culms 1–2 mm. thick at base; leaves 1–2.5 mm. broad, attenuate to long slender tips, glabrous or merely scabrous; achenes subglobose to ovoid, 1–1.8 mm. high, 1.2–1.8 mm. broad (FIGS 5–8)....... 2. *S. minor.*
a. Membranous band puberulent or tomentulose, not sharply differentiated from the puberulent or tomentulose ligule; rhizome usually simple and elongate; plant blue-green, with linear-attenuate leaves 2–6 (rarely –8) mm. broad, puberulent to glabrous, scarcely pilose; achenes ovoid- or ovoid-subglobose, longer than thick, (2–)2.8–3.3 mm. long, 2–2.8 mm. broad (FIGS. 9–12).................. 3. *S. nitida.*

1. S. TRIGLOMERATA Michx. Fl. Bor.-Am. ii. 168 (1803), at least in sense of Torrey, Ann. Lyc. N. Y. iii. 372 (1836) and most later authors.—Eastern Massachusetts to southern Ontario, Wisconsin and Iowa, south to Florida, Alabama, Mississippi, Louisiana and Texas.—Common in southeastern Virginia, especially west of the Dismal Swamp. PLATE 444, FIGS. 1–4.

2. *S. MINOR (Britton) W. Stone, Rep. N. J. State Mus. for 1910: 283 (1911). *S. triglomerata,* var. *gracilis* Britton, Ann. N. Y. Acad. Sci. iii. 230 (1885), not *S. gracilis* Ell. (1824). *S. triglomerata,* var. *minor* Britton in Britton & Brown, Ill. Fl. i. 282 (1896).—Southern New Jersey to North Carolina.—In Virginia frequent to common in peaty or boggy depressions at least of Henrico and Prince George Counties. HENRICO COUNTY: exsiccated swale near Byrd Airport, *F. L. & S.*, no. 5666. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5665; argillaceous and boggy depression north of Gary Church, *F. L. & S.*, no. 5667. FIGS. 5–8.

3. S. NITIDA Willd. in Kunth, Enum. ii. 350 (1837), ex char.—New Jersey to Florida, thence to Mississippi, chiefly in dry sandy woods and thickets.—The Virginia material in the Gray Herbarium is as follows. PRINCESS ANNE COUNTY: dry oak woods, Cape Henry, *F. & G.*, no. 2771 (as *S. triglomerata,* var. *gracilis*). NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4833 (as *S. triglomerata*). ISLE OF WIGHT COUNTY: dry sandy pine and oak woods about 1 mile southeast of Zuni, *F. & L.*, no. 6094; dry sandy pine barrens south of Zuni, *F. G. & L.*, no. 6549; dry sandy yellow pine and oak woods near Walters, *F. & L.*, no. 6095. JAMES CITY COUNTY: sandy soil in thicket, 2½ miles west of Williamsburg, *Grimes*, no. 3843 (as *S. triglomerata*). BEDFORD COUNTY: July 1, 1871, *A. H. Curtiss.* FIGS. 9–12.

Photo. E. C. Ogden.

Scleria triglomerata: fig. 1, inflorescence, × 1; fig. 2, summit of leaf-sheath, × 10; fig. 3, rhizome, × 1; fig. 4, nutlets, × 5.

S. minor: fig. 5, inflorescence, × 1; fig. 6, summit of sheath, × 10; fig. 7, rhizome, × 1; fig. 8, nutlets, × 5.

S. nitida: fig. 9, inflorescence, × 1; fig. 10, summit of sheath, × 10; fig. 11, rhizome, × 1; fig. 12, nutlets, × 5.

Photo. E. C. Ogden.

JUNCUS GRISCOMI: FIG. 1, plant (TYPE), × 2/5; FIG. 2, portion of inflorescence, × 1; FIG. 3, fruit, × 6; FIG. 4, seeds, × 20.
J. EFFUSUS, var. COSTULATUS: FIG. 5, fruits, × 6.
J. GYMNOCARPUS: FIG. 6, fruit, × 6.

S. SETACEA Poir. NORTHAMPTON COUNTY: boggy swale bordering swampy woods south of Kendall Grove, *F. L. & F.*, no. 5247.

Not recorded from Virginia by Core, Am. Sp. Scleria, Brittonia, ii. no. 1 (1936); noted from Princess Anne County in RHODORA, xxxvii. 405 (1935).

CAREX ARENARIA L. NORTHAMPTON COUNTY: sandy woods among the dunes, Savage Neck, *F. & L.*, no. 5249; crest of sandy and argillaceous bluff, Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5250.

Appearing in every way like an indigenous element of the vegetation; seeming to us like a relic on our coast comparable with the many limited colonies from New England to Newfoundland of species which abound in western Europe. Our experience does not support the statement of the late K. K. Mackenzie in the North American Flora, xiii. 39 (1931): "adventive from Europe. . . . Scarcely well enough established to be treated as a member of the North American flora."

C. STIPATA Muhl., var. UBERIOR Mohr (*C. uberior* (Mohr) Mackenz.). Common in swampy woods of NORFOLK and PRINCESS ANNE COUNTIES: east of Little Creek, *F. & G.*, no. 4322.

Presumably the plant intended by Kearney's citation of *C. stipata.*

C. LAEVIVAGINATA (Kükenth.) Mackenz. PRINCESS ANNE COUNTY: swampy woods east of Little Creek, *F. & G.*, no. 4320.

C. SEORSA E. C. Howe. PRINCESS ANNE COUNTY: swamp east of Little Creek, *F. & G.*, no. 4316.

C. HOWEI Mackenz. PRINCESS ANNE COUNTY: wet swale east of Little Creek, *F. & G.*, no. 4315.

*C. FLACCOSPERMA Dew. NORFOLK COUNTY: gum swamp near Cornland, *F. & G.*, no. 4343.

Extension north from North Carolina.

*C. STRICTA Lam. PRINCESS ANNE COUNTY: by creek in gum swamp, west of Pungo, *F. & G.*, no. 4323.

Not seen from Virginia by Mackenzie in preparing the treatment of *Carex* for the North American Flora.

*C. FOLLICULATA L., var. AUSTRALIS Bailey (*C. lonchocarpa* Willd., *C. Smalliana* Mackenz.) NORFOLK COUNTY: alluvial woods near Cornland, *F. & G.*, no. 4347. Frequent in bottomlands and swamps westward to the Fall Line.

Not seen from north of South Carolina by Mackenzie in preparing the treatment of *Carex* for the North American Flora.

*C. RIPARIA Curtis, var. LACUSTRIS (Willd.) Kükenth. (*C. lacustris*

Willd.). Princess Anne County: by creek in gum swamp, west of Pungo, *F. & G.*, no. 4346.

Not seen from south of Delaware and the District of Columbia by Mackenzie in preparing the treatment of *Carex* for the North American Flora.

I am not able to follow Mackenzie in specifically separating the North American *Carex lacustris* from the Old World *C. riparia.* I find myself more in accord with Francis Boott, William Boott, Bailey and Kükenthal in treating it as one of the variations of a semi-cosmopolitan species. Mackenzie's differentiation of the American *C. lacustris* and *C. hyalinopsis* Steud. (*C. riparia*, var. *impressa* S. H. Wright) as species apart from *C. riparia* is not clarified by his characterization (p. 436) of the American *C. lacustris* as having "staminate . . . scales oblong-obovate, obtuse, retuse or emarginate, mucronate," followed on the next page by the explanation, that "In *Carex lacustris*, . . . the staminate scales are cuspidate or awned, while in the other two species they are retuse and mucronate."

*Wolffiella floridana (J. D. Sm.) Thompson. Apparently common in quiet waters of ponds and pools, Princess Anne County: creek between the ponds, Dam Neck, *F. & G.*, no. 4352; Rainey's Pond, *F. G. & L.*, no. 4601; Lake Joyce, *F. G. & L.*, no. 4600. Northampton County: forming dense stranded carpets at borders of small ponds in woods back of the dunes, Savage Neck, *F. L. & F.*, no. 5252, in one pond making a continuous band outside the equally continuous inner zone of *Wolffia punctata.* Surry County: abundant in the pond, Sunken Meadow Beach, *F. & L.*, no. 6789.

*Wolffia punctata Griseb. A species of southern and inland range, occurring from the West Indies and Florida to Texas, north in the interior to northwestern New York (Irondequoit Bay), southern Ontatio and southern Michigan. Northampton County: floating in greatest profusion in a small pond in woods back of the dunes, Savage Neck, inclosed by a broad marginal zone of *Wolffiella floridana.* Surry County: abundant in the pond, Sunken Meadow Beach, *F. & L.*, no. 6788.

First stations in the coastwise region north of Florida. See note under *Cyperus Engelmanni.*

Tillandsia usneoides L. Frequent in the southeastern counties, reaching its northern limit, apparently, in Northampton County: abundant on many species of deciduous trees, Eastville, *F. & L.*, no. 5256.

*Eichornia crassipes (Mart.) Solms. Princess Anne County: in water of cove, southern end of Lake Joyce, *F. L. & F.*, no. 4842.

It is to be hoped that this, the Water Hyacinth, will not spread, as it does in the Gulf States, and thus obliterate *Limnobium* and other rare species of Lake Joyce.

Juncus (§ Genuini) **Griscomi**, sp. nov. (tab. 445, figs. 1–4), planta dense cespitosa habitu *J. effuso* var. *costulato* simillima; caulibus erectis teretis mollibus laete viridibus medulla continua repletis circa 1 m. altis basi 2–3 mm. diametro; cataphyllis arcte vaginatis fulvescentibus membranaceis opacis, supremis 9–11 cm. longis apice rotundatis subuliferis subulo 3–4 mm. longo; inflorescentiis anthelatis laxis regulariter brachiatis 3–8 cm. latis floribus remotis; bracteis infimis teretis erectis 0.8–2 dm. longis; prophyllis chartaceis pallidis lanceolato-ovatis apice attenuato-subulatis; floribus 3–3.6 mm. longis; sepalis (tepalis externis) firmis viridescentibus lanceolato-attenuatis apice subulatis valde costatis margine anguste hyalinis 0.4–0.6 mm. latis; petalis (tepalis internis) simillimis subbrevioribus; staminibus 3 sepalis ⅓ brevioribus; antheris linearibus filamentis paullo longioribus, filamentis apice rufescentibus; capsulis perianthia subaequantibus trigono-oblongis olivaceis nitidis subcoriaceis tricoccis apice rotundato-truncatis valde mucronatis, rostro mucroniformi firmo 0.3–0.5 mm. longo; seminibus 0.6 mm. longis aureo-brunneis inaequaliter ellipsoideis breviter apiculatis, apiculis purpurascentibus, obscure transversim reticulatis.—Princess Anne County, Virginia: about a spring in woods, Little Neck, June 17, 1935, *Fernald, Griscom & Long*, no. 5604 (type in Gray Herb.; isotypes in Herbs. Phil. Acad., Griscom, and elsewhere).

Juncus Griscomi, although superficially suggesting *J. effusus* L., var. *costulatus* Fernald, at once attracted us by its greener color and more open inflorescences and especially by the strong and prominent beaks of the capsules. In *J. effusus* (including its varieties) the capsule (fig. 5) is emarginate or depressed at tip and beakless. In having a definitely beaked capsule *J. Griscomi* suggests the very localized relic, *J. gymnocarpus* Coville (*J. Smithii* Engelm. (1868), not Kunth (1841)), a species known only locally on the Appalachian plateaus of Pennsylvania and Tennessee, with a Coastal Plain area in northwestern Florida. But *J. Griscomi* is not very closely related to *J. gymnocarpus,* which has elongate rhizomes and a hard, usually indehiscent, ovoid to spherical capsule (fig. 6) much longer than the short perianth, and 6 stamens.

In having a beaked or mucronate capsule *Juncus Griscomi* also suggests *J. inflexus* L. (*J. glaucus* Ehrh.), an Old World species somewhat naturalized in North America, but *J. inflexus* is much more slender and glaucous, with stricter inflorescences, smaller and more

fuscous flowers, 6 stamens and more tapering castaneous capsules. The affinity of *J. Griscomi* is, clearly, with *J. effusus*, but its strongly mucronate capsules at once separate it from all forms of that aggregate species. As yet we know it only from the type-station, an extensive springy depression where the localized *Juncus* abounds.

J. Roemerianus Scheele. Common in Princess Anne County, this species extends north at least to Northampton County: border of salt marsh, Old Town Neck, *F. L. & F.*, no. 5260.

Small (Man.) states its northern limit as North Carolina; already recorded by Erlanson from the James River.

J. repens Michx. Northampton County: moist dune-hollows, Savage Neck, *F. L. & F.*, no. 5267. In the Gray Herbarium an old specimen from Nansemond County: Suffolk, October 26, 1831, *Wm. Darlington.* Frequent westward to Southampton, Sussex and Prince George Counties.

Nothoscordum bivalve (L.) Britton. Recorded from Princess Anne County by Kearney; not listed by Grimes or Erlanson. The following specimens in the Gray Herbarium indicate northward extensions. Elizabeth City County: Fortress Monroe, May, 1877, *Thos. Morong;* Hampton, May 4, 1894, *J. R. Churchill;* boggy meadow near sea, Buckroe, *B. L. Robinson*, no. 354. Northampton County: upper border of salt marsh near Kiptopeke, *F. L. & F.*, no. 5268.

*Hypoxis micrantha Pollard. Nansemond County: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4847. Prince George County: dry sandy pine woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, *F. L. & S.*, no. 5733. Previously collected in Fairfax County: moist gravelly soil, hillside thicket north of Occoquan, *L. F. & F. R. Randolph* (distributed as *H. hirsuta*).

The first records from north of North Carolina.

Iris virginica L. Common in swamps and along streams from Princess Anne County westward to the Fall Line; many collections.

*Listera australis Lindl. Princess Anne County: rich pine woods, Creed's, *F. & G.*, no. 4373; rich pine woods, Munden, *F. & G.*, no. 4374.

Not recorded by Wiegand, Bull. Torr. Bot. Cl. xxvi. 165 (1899) from the state.

*Malaxis **Bayardi.** sp. nov. (fig.-text. 1 et tab. 446, figs. 1 et 2), planta habitu *M. unifoliae* simillima 1.2–2.5 dm. alta; cormo 1–1.5 cm. diametro; vaginis basilaribus 2, imis perbrevibus chartaceis apice subtruncatis, superioribus herbaceis 1–2.5 cm. longis apice obliquis; folia laminifera vagina 4–8 cm. longa, lamina elliptica 2.3–5.5 cm. longa 1.2–2.5 cm. lata; pedunculo 3–7 cm. alto; racemo in anthesi lineari-

cylindrico 5–12 cm. longo 5–10 mm. diametro; bracteis ovatis 1–1.5 mm. longis basi decurrentibus; pedicellis adscendentibus 2–4.5 mm. longis; floribus numerosis viridescentibus 2.5–3.5 mm. longis; sepalis lateralibus ovato-lanceolatis obliquis obtusis 1.2–1.7 mm. longis, sepalo medio lineari-oblongo circa 2 mm. longo; petalis linearibus quam sepala media brevioribus; labio late cordato-deltoideo 2.5 mm. longo 2.2–2.5 mm. lato lobis basalaribus subdivergentibus 1–1.4 mm. longis, lobis terminalibus lateralibus deltoideis 0.4–0.6 mm. longis, lobo medio 0.2–0.3 mm. longo.—VIRGINIA: dry sandy woods and adjacent clearings, Kilby, Nansemond County, September 11, 1935, *M. L. Fernald, Bayard Long & John M. Fogg, Jr.*, no. 4851 (TYPE in Gray Herb.; ISOTYPES in Herbs. Phil. Acad. and Univ. Penn.). NORTH CAROLINA: Blowing Rock, Watauga County, August 5, 1893, *B. L. Robinson*, no. 97 in part (mixed with and distributed as *Microstylis ophioglossoides* Nutt.).

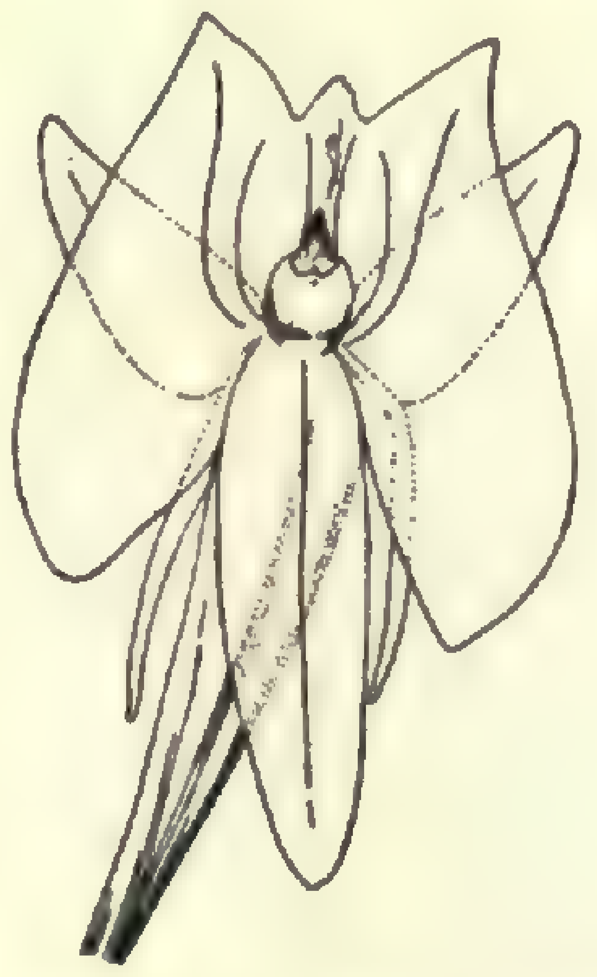

FIG. 1. FLOWER OF MALAXIS BAYARDI, laid open, × 10.

Malaxis Bayardi (for its discoverer, BAYARD LONG) is a highly localized plant, but is presumably of broader range through the southeastern states than the two collections at hand would indicate. The sheet from Blowing Rock, in the Blue Ridge of northwestern North Carolina, contains 2 plants of *M. unifolia* Michx. (*Microstylis ophioglossoides* Nutt.) and two of the newly described species, mixed and apparently not differentiated by Dr. Robinson in collecting them. At the type-locality, Kilby, *M. Bayardi* was found under the thicket bordering pine (*Pinus echinata*) and oak woods in the Coastal Plain of southeastern Virginia.

Long, Fogg and I, venturing westward from our centre in Princess Anne County, found northern Nansemond County occupied largely by a different flora (see p. 378). With very limited time at our disposal, we were collecting small series of each interesting plant. Long, reaching under the overhanging shrubs, collected a specimen of the strange *Malaxis* and called our attention to it. My own enthusiasm to help was promptly diminished through an attack by ants upon my bare arms; but Long and Fogg between them secured sufficient specimens for a good type-series.

The nearest relatives of *Malaxis Bayardi* are the common North American *M. unifolia* Michx. (FIG. 3 and TEXT-FIG. no. 2) and *M. Grisebachiana* Fawc. & Rendle, of the West Indies. Both of the latter species have thick- or oblong-cylindric spikes. That of *M.*

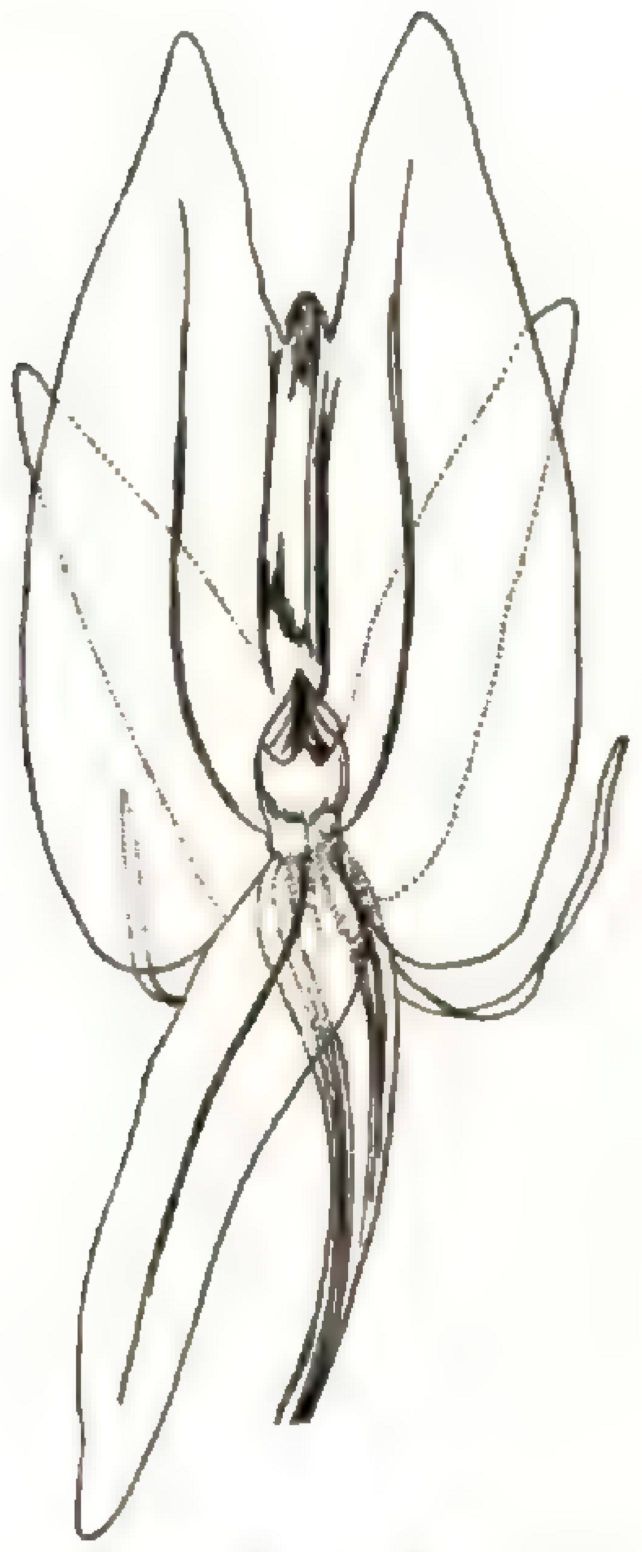

Fig. 2. Flower of Malaxis unifolia, laid open, × 10.

unifolia, when fully expanded, 1–10 cm. long and 1.3–2.5 cm. thick, with mature divergent pedicels 4–8 mm. long. In *M. unifolia* the larger flowers (fig. 3 and text-fig. 2) have the oblong-oval lip shallowly cordate at base, with the 2 lateral apical lobes elongate, the central one a tiny tooth. The West Indian *M. Grisebachiana*, as shown by the illustrations (Fawcett & Rendle, Fl. Jam. i. t. 6, figs. 18–23) and by the West Indian specimens, has a short and thick raceme like that of *M. unifolia*, but an almost quadrate short-oblong lip only 1.75 mm. broad and with comparatively short basal lobes.

In its very slender raceme *Malaxis Bayardi* suggests the calcicolous boreal *M. brachypoda* (Gray) Fern. in Rhodora, xxviii. 176 (1926) and xxxv. 241, t. 253, figs. 1–4 (1933); but *M. brachypoda* has the leaf nearly basal, yellowish and larger flowers, narrower bracts, and drooping cordate lip with prolonged entire tip.

(*To be continued*)

NEW NAMES AND NEW COMBINATIONS FOR TEXAS PLANTS

V. L. Cory

Prior to the publication of a check list of the plants of Texas by the Texas Agricultural Experiment Station to take place at an early date, it is found desirable to publish the new names and the new combinations that will be used in that list. In general these changes are needed to bring the nomenclature up to date and in harmony with the International Rules and conservative usage.

New Names

Descurainia **multifoliata,** nom. nov. *Sophia millefolia* Rydb. ex Britton, Man. ed. 2, 462. 1905. Not *D. millefolia* (Ait.) Webb. & Berth. 1836.

Cassia **Fisheri,** nom. nov. *Chamaecrista rostrata* Woot. & Standl. Contr. U. S. Nat. Herb. **16:** 135. 1913. Not *Cassia rostrata* Voigt, 1928. Named for its collector, my friend, Geo. L. Fisher.

Astragalus **Microphacos**, nom. nov. *Dalea parviflora* Pursh, Fl. Amer. Sept. 474. 1814. *A. parviflorus* MacMill., 1892, not *A. parviflorus* Lam., 1783. *A. gracilis* A. Gray, 1864, not *A. gracilis* Nutt., 1818. *Microphacos parviflorus* Rydb., 1913.

Psoralea **Rydbergii**, nom. nov. *Pediomelum humile* Rydb., N. A. Fl., **24**: 24. 1919. Not *P. humilis* Mill., Gard. Dict. ed. 8. *Psoralea* no. 7, 1768.

Oxalis **oreophila**, nom. nov. *Ionoxalis monticola* Small, N. A. Fl. **25**: 42. 1907. Not *O. monticola* Arech., Anal. Mus. Nac. Montevideo, 3: 231. 1900. Fl. Uruguay, **1**: 231. 1900.

Mammillaria **Engelmannii**, nom. nov. *Echinocactus Muehlenpfordtii* Poselg., Allg. Gartenz. **21**: 102. 1853. Not *M. Muehlenpfordtii* Foerst, ex Otto & Dietr., Allg. Gartenz. **15**: 49. 1847. *M. Scheeri* Muehlenpf., var. *valida* Engelm., Proc. Amer. Acad. **3**: 265. 1856. Not *M. valida* Webber, Dict. Hort. Bois. 806. 1898.

Mammillaria **Escobaria**, nom. nov. *Escobaria Runyonii* Britton & Rose, Cactaceae **4**: 55. 1923.

Hedeoma **texana**, nom. nov. *Hedeoma ciliata* Benth. ex DC. Prod. **12**: 245. Nov., 1848. Not *H. ciliata* Nutt., Journ. Acad. Phila. II. **1**: 183. Aug., 1848. *Stachydeoma ciliata* Small.

New Combinations

Bouteloua hirsuta Lag., var. **pectinata** (Featherly), comb. nov. *B. pectinata* Featherly, Bot. Gaz., **91**: 103. 1931.

Camassia **scillioides** (Raf.), comb. nov. *Cyanotris scillioides* Raf., Am. Month. Mag. **3**: 356. 1818. *Lamotris hyacinthina* Raf., 1836. *Quamassia hyacinthina* Britton.

Juncus tenuis Willd., var. **platyphyllus** (Wiegand), comb. nov. *J. dichotomus* Ell., var. *platyphyllus* Wiegand, Bull. Torr. Bot. Club, **30**: 448. 1903.

Agave **tigrina** (Engelm.), comb. nov. *A. virginica* L., var. *tigrina* Engelm., Trans. Acad. Sci. St. Louis, **3**: 302. 1875.

Spiranthes **floridana** (Wherry), comb. nov. *Ibidium floridanum* Wherry, Jour. Wash. Acad. Sci. **21**: 49, fig. 1. 1931.

Spiranthes **Reverchonii** (Small), comb. nov. *Gyrostachys Reverchonii* Small, Bull. Torr. Bot. Club, **25**: 610. 1898.

Quercus **stellipila** (Sarg.) Parks,[1] comb. nov. *Q. texana* Buckl., var. *stellipila* Sarg., Bot. Gaz. **65**: 424. 1918.

Tidestromia lanuginosa (Nutt.) Standl., var. **carnosa** (Steyermark), comb. nov. *Cladothrix lanuginosa* Nutt., var. *carnosa* Steyermark, Ann. Mo. Bot. Gard. **19**: 389. 1932.

Mirabilis Jalapa L., var. **Lindheimeri** (Standl.), comb. nov. *M. Jalapa* L., subsp. *Lindheimeri* Standl., Contr. U. S. Nat. Herb. **12**: 368. 1909.

[1] Mr. H. B. Parks, Chief, Division of Apiculture, Texas Agr. Expt. Station, who is completing his study of the oaks of Texas.

Nymphaea **lekophylla** (Small), comb. nov. *Castalia lekophylla* Small, Man. Southeastern Fl. 543. 1933.

Descurainia **andrenarum** (Cockerell), comb. nov. *Sophia andrenarum* Cockerell, Bull. Torr. Bot. Club, **24**: 48. 1901.

Rorippa obtusa (Nutt.) Britton, var. **sphaerocarpa** (A. Gray), comb. nov. *Nasturtium sphaerocarpum* A. Gray, Mem. Amer. Acad., **4**: 6. 1849.

Streptanthus **validus** (Greene), comb. nov. *Disaccanthus validus* Greene, Leaflets **1**: 225. 1906.

Acacia **densiflora** (Alexander), comb. nov. *Vachellia densiflora* Alexander ex Small, Man. Southeastern Fl. 665. 1933.

Cassia **littoralis** (Pollard), comb. nov. *Chamaecrista littoralis* Pollard, Proc. Biol. Soc. Wash. **15**: 20. 1902.

Psoralea **caudata** (Rydb.), comb. nov. *Pediomelum caudatum* Rydb., N. A. Fl. **24**: 19. 1919.

Psoralea **psoralioides** (Walt.), comb. nov. *Trifolium psoralioides* Walt., Fl. Carol. 184. 1788. *Hedysarum pedunculatum* Mill., Gard. Dict., ed. 8. Hedysarum No. 17. 1768. *P. pedunculata* Vail, 1894, not *P. pedunculata* Poir., 1816.

Dalea **laxa** (Rydb.), comb. nov. *Parosela laxa* Rydb., N. A. Fl. **24**: 85. 1920.

Dalea **longipila** (B. L. Robinson ex Rydb.), comb. nov. *D. mollis* Benth., var. *longipila* B. L. Robinson ex Rydb. N. Am. Fl. **24**: 64. 1919 (in synom.). *Parosela longipila* Rydb., l. c. 1919.

Dalea **neomexicana** (A. Gray), comb. nov. *D. mollis* Benth. (?), var. *neomexicana* A. Gray, Pl. Wright. **1**: 47. 1852. *Parosela neomexicana* Heller, Cat. Pl. N. Am. ed. 2, 6. 1900.

Tephrosia **leucosericea** (Rydb.), comb. nov. *Cracca leucosericea* Rydb., N. A. Fl. **24**: 163. 1923.

Tephrosia **texana** (Rydb.), comb. nov. *Cracca texana* Rydb., N. A. Fl. **24**: 176. 1923.

Sesbania **Drummondii** (Rydb.), comb. nov. *Daubentonia Drummondii* Rydb., Am. Journ. Bot., **10**: 498. 1923. *Daubentonia longifolia* of authors; in part of DC., as to description.

Sesbania **exaltata** (Raf.), comb. nov. *Darwinia exaltata* Raf., Fl. Ludov. 106. 1817. *Sesban exaltatus* Rydb., 1924.

Astragalus **Emoryanus** (Rydb.), comb. nov. *Hamosa Emoryana* Rydb., Bull. Torr. Bot. Club, **54**: 327. 1927.

Astragalus **leptocarpoides** (M. E. Jones), comb. nov. *A. Nuttallianus* DC., var. *leptocarpoides* M. E. Jones, Contr. W. Bot. **8**: 22. 1898. *Hamosa leptocarpoides* Rydb., 1927.

Astragalus **macilentus** (Small), comb. nov. *Hamosa macilenta* Small, Fl. Se. U. S. 618, 1332. 1903.

Astragalus **Tracyi** (Rydb.), comb. nov. *Phaca Tracyi* Rydb., N. A. Fl. **24**: 351. 1929.

Euphorbia **Ingallsii** (Small), comb. nov. *Chamaesyce Ingallsii* Small, Fl. Se. U. S. 708, 1333. 1903.

EUPHORBIA **Stanfieldii** (Small), comb. nov. *Chamaesyce Stanfieldii* Small, Fl. Se. U. S. 712, 1333. 1903.

RHAMNUS PURSHIANA DC., var. **betulaefolia** (Greene), comb. nov. *R. betulaefolia* Greene, Pittonia **3**: 16. 1929.

SIDA **sagittaefolia** (A. Gray), comb. nov. *S. lepidota* A. Gray, var. *sagittaefolia* A. Gray, Pl. Wright. **1**: 18. 1852. *Disella sagittaefolia* Greene, 1906.

MAMMILLARIA **Runyonii** (Britton & Rose), comb. nov. *Coryphantha Runyonii* Britton & Rose, Cactaceae **4**: 26. 1923.

MAMMILLARIA **Sneedii** (Britton & Rose), comb. nov. *Escobaria Sneedii* Britton & Rose, Cactaceae **4**: 56. 1923.

HEIMIA **longipes** (A. Gray), comb. nov. *Nesaea longipes* A. Gray, Pl. Wright. **1**: 68. 1852.

VACCINIUM **Langloisii** (Greene), comb. nov. *Polycodium Langloisii* Greene, Leafl. Bot. Obs. & Crit. **2**: 226. 1912.

SALVIASTRUM TEXANUM Scheele, var. **canescens** (A. Gray), comb. nov. *Salvia texana* (Scheele) Torr., var. *canescens* A. Gray, Proc. Am. Acad. **8**: 368. 1872.

MONARDA PUNCTATA L., var. **Stanfieldii** (Small), comb. nov. *M. Standfieldii* Small, Fl. Se. U. S., 1038. 1903.

AGASTACHE **pallida** (Lindl.), comb. nov. *Cedronella pallida* Lindl., Bot. Reg. t. 29. 1846.

PENSTEMON TRIFLORUS Heller, var. **integrifolius** (Pennell), comb. nov. *P. triflorus* Heller, subsp. *integrifolius* Pennell, Acad. Nat. Sci. Phil. Mon. **1**: 252. 1935.

PENSTEMON GUADALUPENSIS Heller, var. **Ernesti** (Pennell), comb. nov. *P. guadalupensis* Heller, subsp. *Ernesti* Pennell, Acad. Nat. Sci. Phil. Mon. **1**: 251, 252. 1935.

GERARDIA FLAVA L., var. **reticulata** (Raf.), comb. nov. *Aureolaria reticulata* Raf., New Fl. Amer. **2**: 59. 1837. *Dasystoma bignoniiflora* Small, 1899.

GERARDIA GRANDIFLORA Benth., var. **cinerea** (Pennell), comb. nov. *Aureolaria grandiflora* (Benth.) Pennell, subsp. *cinerea* Pennell, Proc. Acad. Nat. Sci. Phila., **73**: 510. 1922.

ELYTRARIA **acuminata** (Small), comb. nov. *Tubiflora acuminata* Small, Fl. Se. U. S. 1082, 1338. 1903.

LIATRIS **Langloisii** (Greene), comb. nov. *Laciniaria Langloisii* Greene, Pittonia **5**: 58. 1902.

APLOPAPPUS **annuus** (Rydb.), comb. nov. *Sideranthus annuus* Rydb., Bull. Torr. Bot. Club, **25**: 472. 1898.

APLOPAPPUS **validus** (Rydb.), comb. nov. *Isopappus validus* Rydb., Brittonia **1**: 100. 1931.

ASTER **linearis** (Greene), comb. nov. *Machaeranthera linearis* Greene, Bull. Torr. Bot. Club, **24**: 511. 1897.

IVA **pedicellata** (Rydb.), comb. nov. *Cyclachaena pedicellata* Rydb., N. A. Fl. **33**: 10. 1922.

EVAX **nivea** (Small), comb. nov. *Filago nivea* Small, Bull. Torr. Bot. Club, **24**: 333. 1897.

POLYPTERIS **macrolepis** (Rydb.), comb. nov. *Othake macrolepis* Rydb., Bull. Torr. Bot. Club, **37**: 332. 1910.

POLYPTERIS **robusta** (Rydb.), comb. nov. *Othake robustum* Rydb., N. A. Fl. **34**: 60. 1914.

ACTINEA RICHARDSONI (Hook.) Kuntze, var. **floribunda** (A. Gray), comb. nov. *Actinella Richardsoni* Hook., var. *floribunda* A. Gray, Mem. Amer. Acad. n. ser. **4**: 101. 1849.

ACTINEA **texana** (Coulter & Rose), comb. nov. *Actinella texana* Coulter & Rose, Bot. Gaz. 16: 27. 1891.

DYSSODIA **gracilis** (Rydb.), comb. nov. *Thymophylla gracilis* Rydb., N. A. Fl. **34**: 176. 1915.

CIRSIUM **Helleri** (Small), comb. nov. *Carduus Helleri* Small, Fl. Se. U. S. 1307, 1341. 1903.

STEPHANOMERIA **neomexicana** (Greene), comb. nov. *Ptiloria neomexicana* Greene, Bull. Torr. Bot. Club, **25**: 123. 1898.

TEXAS AGRICULTURAL EXPERIMENT STATION,
Sonora, Texas.

EPIGAEA REPENS, forma PLENA in Connecticut.—Rarely, nature challenges the horticulturist by producing a double form of a wild flower. Such a form of the mayflower has been known at least since 1872 and has been named *Epigaea repens*, f. *plena* Rehder. It has been found at two stations each in Massachusetts and Maine, but seems not to have been reported from Connecticut.

It is therefore of interest to record its occurrence in that state. It was found in 1928 in the township of Madison by Esther Byington-Lindquist. The colony has been under observation regularly since and has consistently produced exquisite double blooms each year. Like constancy was noted in the plants found in 1872 in Massachusetts. The flowers have twelve or more small petals growing like dainty rosettes; they are not as large as many of the single blooms.—E. H. BYINGTON, Guilford, Connecticut.

Volume 38, no. 454, including pages 333–372 and plates 437 and 438, was issued 17 October, 1936.

Photo. E. C. Ogden.

Malaxis Bayardi: fig. 1, four plants (type), × 1; fig. 2, portion of raceme, × 10. M. unifolia: fig. 3, raceme, × 1.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 38. December, 1936. No. 456.

A BOTANICAL SCRAPBOOK

Nicholas Polunin

In preparing a flora of the northernmost regions of Eastern North America, nowadays generally referred to as the "Canadian Eastern Arctic," I am attempting to gather together, revise and fully record all of the more substantial plant collections that have been made therein.[1] These collections are numerous and often quite extensive, having been brought back from almost all parts of the Canadian Eastern Arctic during the past century and a quarter, but with a few exceptions they have never been critically worked out, or at least have not been published upon. Indeed we have only to exclude Simmons' excellent "Flora of Ellesmereland"[2] and "Phytogeography,"[3] a recently published account of the vegetation of Akpatok Island,[4] and some scattered references that are diffused through other works, to say that the botanical literature of these vast tracts is

[1] The area concerned is difficult to define exactly, but except that it excludes Greenland, and for the present purpose also Ellesmereland (whose flora is well known) and Boothia Felix, it may be said to comprise most of the mainland of North America that lies east of Long. 95° W. and north of Lat. 60° N., and all of the islands (including the 1000-miles long Baffin Land) of the Arctic Archipelago that lie either wholly or in part within these boundaries. I should be very pleased to hear of any further collections from within this area that I have not already seen in North America or shall not be likely to see in visiting the main European herbaria.

[2] "The Vascular Plants in the Flora of Ellesmereland" *Report of the Second Norwegian Arctic Expedition in the 'Fram' 1898–1902.* Nr. 2: pp. 1–198. Kristiania 1906: by Herman G. Simmons.

[3] "A Survey of the Phytogeography of the Arctic American Archipelago with some Notes about its Exploration." *Lunds Universitets Årsskrift.* Nr. 19: pp. 1–183. Lund 1913: by Herman G. Simmons.

[4] "The Vegetation of Akpatok Island, Part I" *Journal of Ecology.* **22**: pp. 337–395. 1934 and id., Part 2 *Journal of Ecology.* **23**: pp. 161–209. 1935: by Nicholas Polunin.

limited to a mere half-dozen short lists of the more conspicuous plants that are to be observed at certain coastal points.

The most recent and extensive collections from within this area are in the possession either of the Gray Herbarium of Harvard University or of the National Herbarium of Canada at Ottawa; but while the vast majority of the *early* collections were made by adventurous Englishmen and so are housed in the British Museum or Kew Herbarium, there has nevertheless come to light on this side of the Atlantic one scrapbook containing several old collections. These are of such absorbing interest and historical value that they must surely not be missed by any student of the flora of Arctic America, while a survey of the history and contents of the scrapbook may well prove of interest to an even wider circle of readers.

The existence of this scrapbook was mentioned to me recently by Professor J. H. Faull of Harvard and enquiries soon led to its being loaned to the Gray Herbarium through the kind offices of Dr. Thomas M. C. Taylor of the Department of Botany of the University of Toronto. It appears to have been compiled in the 1850's by one "Adam White Esq., F.L.S. &c., British Museum," from specimens given him by their collectors—not for him to identify but to keep for his own edification, since he seems to have been "a mere entomologist with an eye for flowers." Handed down in the family, it has recently been presented to the University of Toronto by a descendant residing in that city.

The scrapbook contains, among illustrations of varying appropriateness, an autographed engraving of the navigator W. E. Parry and an original watercolour sketch "to Adam White F.L.S. C.Ede del. Griffiths Island. Grave of G. S. Malcolm A.B. H.M.S. Resolute who died from the effects of frostbite in the feet." With engaging naïvete we are told in another appended handwritten note that "The plant which covered Malcolm's grave was the *Saxifraga oppositifolia.* This is the favourite flower of Dr. Greville, as ascertained by Dr. Johnston who wrote to ask him." Among other curios that are stuck in the book is a large piece of birch bark on which we see written (apparently in December 1835) "From Fort Reliance, brought home by Captain Back" and signed, "John Richardson." There is also a specimen of *Parrya arctica* R.Br. labelled by the great Robert Brown himself as "For Mr. Adam White: Sir James Ross's last Voyage."

These and a few other items, connected as they are with well-known

early navigators and pioneer explorers and naturalists, add considerable human interest to the scrapbook; but its real *value* lies in the plant collections which it contains, and of each one of these I will now give some account in the order in which it appears in the book.

First there is a series of 36 plants, mostly different species of phanerogams and many of them unnamed, collected by Dr. Peter C. Sutherland as recounted in his "Journal of a Voyage in Baffin's Bay and Barrow Straits in the years 1850–1851, performed by H.M. Ships 'Lady Franklin' and 'Sophia,' under the command of Mr. William Penny, in search of the missing crews of H.M. Ships 'Erebus' and 'Terror.' "[1] Most of the plants were collected in the summer of 1851 around the wintering quarters of the expedition at Assistance Bay, Lat. 74° 40′ N. Long. 94° 16′ W. on Cornwallis Island, but a few came from Bushnan (often spelled Bushman) Island, Lat. 76° N. and Berry Island, Lat. 73° 20′ N. (both on the Greenland side of Baffin's Bay) while one is marked "Northumberland Inlet,"[2] a locality which was however not visited by the expedition. Each specimen is labelled fully with locality and date, with generally some information as to the habitat, and, at the bottom, "H.M.S. Sophia."

A list of the "Plants collected during the voyage, and named by Sir W. J. Hooker, K.H. D.C.L. F.R.S. & L.S. etc." is given as an appendix to Sutherland's "Journal." The expedition having been "ordered to push forward in the search for Franklin," little scientific work was done and this list of plants is short, consisting of only 54 items representing about 46 species and varieties, nearly half of whose names now have to be changed. The collection in the scrapbook, while it appears to have been given to Adam White on the return

[1] London 1852: 2 vols.

[2] The label attached to this plant, a relatively luxuriant flowering specimen of *Pyrola grandiflora* Rad., reads: "Kennooksvooke Northumberland Inlet Lat. 67° North Long. 65° W. September 1846 Pyrola. The esquimaux and Danish settlers in West Greenland prize it as a valuable antiscorbutic." This label is in the spidery handwriting of Sutherland and the plant was evidently collected by him on a previous expedition (he mentions in the introduction to his "Journal" that he had already accompanied Capt. Penny "in two whaling voyages round Baffin's Bay"). Nevertheless we find this and nine other species from Northumberland Inlet mentioned in Sutherland's "Journal" in the list of "Plants collected during the voyage," with the result that Simmons in his "Phytogeography" (l.c.) has assumed Northumberland Inlet to be in the northwest of Devon Island and has erroneously recorded these plants as having been collected there by Sutherland. In reality Northumberland Inlet lies a full thousand miles to the southeast, being the large inlet in southeastern Baffin Land now called Cumberland Sound. Nor was it discovered, as Sutherland writes on p. clxxxix of the appendix to his "Journal," by Captain Penny who called it "Hogarth Sound," but instead by Davis who already in 1585 appears to have given it the name of Cumberland Inlet.

of the expedition and hence not to have been seen by the elder Hooker, does not afford any notable additions with the exception of *Poa abbreviata* R. Br. from Assistance Bay. Nevertheless it is valuable, even apart from its age and sentimental connections, as a duplicate set from the material which to this day affords almost the sole basis of our admittedly slender knowledge of the flora of Cornwallis Island.

Mixed in the book with these specimens of Sutherland's made in 1851 or previously are (1) a few others collected by him at various points up the West Coast of Greenland when serving on another Franklin search expedition on which he embarked the year after his return from the first and (2) six specimens of phanerogams collected on Cornwallis Island in 1851 by "Charles Ede R.N." An old newspaper cutting stuck in the scrapbook tells us that "Mr. Ede was assistant surgeon to Captain Ommanney's ship, on her late search after Sir John Franklin." This was H.M.S. Assistance, for which Assistance Bay was named. These specimens do not appear ever to have been noticed before; at least I can find no reference to them in arctic botanical literature, although often the collection of only a single plant by one of these early voyagers has been sufficient for his immortalisation therein! There are also in the scrapbook a few other phanerogams collected by Ede in Wolstenholme Sound and at other points on the Greenland side of Baffin's Bay, and several cryptogams collected on Cornwallis Island and at various points along the west coast of Greenland.[1]

Next in the scrapbook comes a series of 13 plants introduced as "collected by Sir John Richardson on his last journey to the shores of Arctic America when searching for Sir John Franklin." The plants are all different species of dicotyledons and are named in Richardson's handwriting but without date or even locality except of the vaguest order, almost all being merely labelled "arctic sea coast." Such vague labels, including Euphorbias which I have seen marked "Arctic

[1] A specimen of *Thymus Serpyllum* L. var. *prostratus* Horn. against which is marked in the handwriting of Ede "Wolstenholme Sound Dr Sutherland" must surely have been collected elsewhere. The species is well known in West Greenland but according to M. P. Porsild (Meddelelser om Grønland 1926 p. 140) is "a distinct southern type" having its northernmost limit near Holsteinsborg (Lat. 66° 55′ N.) whereas Wolstenholme Sound lies around a latitude of 76° N. This specimen, exhibiting luxuriant growth and abundant flowers or their remains, was probably collected at Fiskernaes in southwest Greenland, a locality already represented by a specimen of *Bartsia alpina* L. on the very same page of the scrapbook. A specimen on another page of *Lychnis alpina* L. "Wolstenholme Sound Dr Sutherland" seems more feasible since, although this too is rather a southern species, it has been recorded from at least as far north as 72° N. on the West Coast of Greenland.

N. Amer.," are characteristic of many of Richardson's large collections and have caused a great deal of trouble to students of the flora of the areas through which he travelled. Indeed Richardson seems to have been a rather vague sort of person himself, although in other ways a most admirable one, for in a letter dated October 2nd 1850 which is stuck in the scrapbook and which he wrote apparently to Adam White he begins "My dear Sir: According to promise I send you a few specimens of plants gathered on the shores of the Arctic Sea. I have stupidly mislaid the address of the gentleman who translated . . . for me. If you can quietly ascertain . . . " However in the present instance the plants appear to have been gathered in all cases either at or within a few hundred miles to the east of the "Mouth of the Mackenzie" (one specimen is indeed so labelled) and, except for rather minor range extensions in the cases of "Salix speciosa" and "Hippuris maritima," to have been covered by the elder Hooker in his well-known "Flora Boreali-Americana," the principal material for which indeed came from Richardson's earlier collections.

There follow in the scrapbook a single specimen from Skellefteå in Sweden, collected in 1854 by J. Wolley, and then 20 phanerogams collected in southern Norway by L. Esbark, well preserved but of no particular interest. Also well preserved but this time of considerable interest and value is the last collection in the book. This consists of about 25 species of dicotyledons, almost all "pretty flowers" but named only as far as the genus, with engraved labels headed "Herb. Ind. Or. Hook. fil. et Thomson." They thus formed part of the great collections made by Drs. J. D. Hooker and Thomas Thomson in India and the Himalayas in the late 1840's, which resulted in a number of well-known botanical and other works, including their combined but never finished "Flora Indica" (the first volume of which was published in 1855, to be followed by "Praecores ad Floram Indicam" in the Journal of the Linnean Society), Thomson's "Western Himalaya and Tibet," Hooker's "Himalayan Journals" and finally his great seven-volume "Flora of British India."

The Governing Body of the University of Toronto are indeed to be congratulated on having acquired such an historically interesting and valuable scrapbook, and to be thanked for their generosity in giving me such free access to its contents.

Gray Herbarium.

PLANTS FROM THE OUTER COASTAL PLAIN OF VIRGINIA

M. L. Fernald

(*Continued from page 404*)

Ostrya virginiana (Mill.) K. Koch, var. **lasia**, var. nov., ramulis dense subpersistenterque villosis.—Coastal Plain from Florida to Texas, north to Virginia, and less characteristically and more rarely to southeastern Massachusetts, inland through the Mississippi Basin to western Tennessee, southern Illinois, Iowa and South Dakota. Type: Lake City, Columbia County, Florida, July 11–19, 1895, *G. V. Nash*, no. 2158 (in Gray Herb.).

The Virginia collections are as follows: Henrico County: Richmond, May 5, 1894, *J. R. Churchill.* Princess Anne County: rich dry woods, Little Neck, *Fernald, Griscom & Long*, no. 4627. Norfolk County; dry rich woods, east of Gertie, *Fernald, Griscom & Long*, no. 4628.

Typical *Ostrya virginiana*, with the new branchlets glabrous or merely sparsely pilose and glabrate (or stipitate-glandular but otherwise glabrous in forma *glandulosa* (Spach) Macbr.) is the characteristic northern tree, occurring from Nova Scotia to Manitoba, south to the interior of Virginia, the uplands of Georgia and Tennessee, Missouri and Oklahoma. Var. *lasia* takes its place in lower areas of the southern Coastal Plain. Forma *glandulosa* occurs sporadically throughout the range of the glabrous-twigged typical *O. virginiana.*

Mr. C. A. Weatherby, who, in 1935, sought the type of *Carpinus virginiana* Mill. Gard. Dict. ed. 8, upon which the name *Ostrya virginiana* rests, reports that there seems to be no clearly identifiable specimen to stand as the type. I am, therefore, accepting the smoother extreme of the species.

In 1841 Spach defined two variations of our hop-hornbeam, *O. virginica* Willd., α. *glandulosa* and β. *eglandulosa* Ann. Sci. Nat. sér. 2, xvi. 246 (1841). His var. *glandulosa* was properly reduced to formal rank as *O. virginiana*, forma *glandulosa* (Spach) Macbr., Field Mus. Pub. Bot. iv. 192 (1929). In so doing Macbride seems to have left Spach's *O. virginica* β. *eglandulosa* to stand as typical *O. virginiana.*

Quercus virginiana Mill. Northampton County: a single shrub in peaty clearing south of Townsend, *F. L. & F.*, no. 5292.

Extension north from Cape Henry.

*Q. cinerea Michx. Princess Anne County: small trees among the sand dunes, Cape Henry, *F. L. & F.*, no. 4863.

Extension north from North Carolina.

CELTIS LAEVIGATA Willd. (*C. mississippiensis* Bosc). PRINCESS ANNE COUNTY: dry wooded slope near Third Street Bridge, Great Neck, trees 10 m. high, *F. & L.*, no. 4866; rich woods, Cedar Island, *F. G. & L.*, no. 4630, distributed as *C. occidentalis*, var. *submembranacea* Fern. Passing to

C. LAEVIGATA, var. SMALLII (Beadle) Sarg. (*C. occidentalis*, var. *submembranacea* Fern. in RHODORA, xxxvii. 425 (1935)). To the station on Knott's Island add the following, also in PRINCESS ANNE COUNTY: rich woods, Cedar Island, trunks up to 6 dm. in diameter, *F. G. & L.*, no. 4631; dry wooded slope near Third Street Bridge, Great Neck, *F. & L.*, no. 4867. SOUTHAMPTON COUNTY: wooded bottomland of Meherrin River, above Haley's Bridge, *F. L. & S.*, no. 5767.

ASARUM ARIFOLIUM Michx. PRINCESS ANNE COUNTY: rich pine woods, Munden, *F. & G.*, no. 4387; pine woods, Creed's, *F. & G.*, nos. 4388, 4389.

Evidently rare in Virginia; not seen by us farther north nor west.

POLYGONUM DENSIFLORUM Meisn. (*P. portoricense* Bertero). See Weatherby, RHODORA, xxv. 20 (1923). PRINCESS ANNE COUNTY: peaty margin of cove, southern end of Lake Joyce, *F. L. & F.*, no. 4872, as *P. portoricense*. SURRY COUNTY: margin of pond in cypress swamp, Sunken Meadow Beach, *F. & L.*, no. 6810.

Not recorded by Kearney.

P. CRISTATUM Engelm. & Gray. NORTHAMPTON COUNTY: dry sandy and argillaceous pine woods back of the shore-bluff, west of Kiptopeke, *F. L. & F.*, no. 5300. SUSSEX COUNTY: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6200; border of dry sandy woods, 4 miles south of Stony Creek, *F. G. & L.*, no. 6590.

Not recorded by Kearney, Grimes nor Erlanson.

*SALICORNIA MUCRONATA Bigel. NORTHAMPTON COUNTY: border of salt marsh east of Eastville, *F. & L.*, no. 5303.

First collection in the Gray Herbarium from Virginia; not recorded by Kearney, Grimes nor Erlanson.

S. EUROPAEA L. PRINCESS ANNE COUNTY: salt marsh, arm of Lynnhaven Bay, at Third Street Bridge, Great Neck, *F. & L.*, no. 4876.

Not recorded by Kearney.

S. AMBIGUA Michx. PRINCESS ANNE COUNTY: moist sand, 1 mile east of Lynnhaven Inlet, *L. F. & F. R. Randolph*, no. 437; salt marsh, arm of Lynnhaven Bay, at Third Street Bridge, Great Neck, *F. & L.*, no. 4875.

Not listed by Kearney.

*Iresine rhizomatosa Standl. Princess Anne County: rich woods, Cedar Island, *F. G. & L.*, no. 4635.

Described by Standley as occurring in Texas, Oklahoma, Kansas, Missouri, Alabama, and Tennessee, with the type-collections from Plummers Island in the Potomac in Montgomery County, Maryland. Standley specially noted the remarkable northeastern isolation on Plummers Island, saying:[1]

> The occurrence of the plant upon Plummers Island is of great interest, for the station is the northernmost locality now known for the species and for the genus. It seems probable that seeds have been brought down by the Potomac from some locality in the mountains, although the genus is not known upon the east slope of the Alleghenies; or perhaps the plants are the last survivors of ancestors which had a wider range in Maryland and Virginia. There are several colonies of the plant upon Plummers Island consisting of numerous individuals, but in 1915 only two or three plants flowered.

Cedar Island, in Back Bay, is on the outer Coastal Plain, 145 miles southeast of Plummers Island. It is not probable that seeds have recently been arriving there, without colonies starting in intermediate spots. I strongly endorse Standley's suggestion that the Plummers Island "plants are the last survivors of ancestors which had a wider range in Maryland and Virginia." The isolation of the species on Cedar Island favors this interpretation; it is quite parallel with numerous other isolations on the Coastal Plain.

Notes on Paronychia, § Anychia (plate 447, all figs. × 10).—*Anychia* Michx. Fl. Bor.-Am. i. 112 (1803) is a strictly North American group. Commonly kept apart as a genus, it met the challenge of Fenzl as early as 1840, the latter great student of the *Caryophyllales* reducing it to *Paronychia* Adans. as *Paronychia*, § *Anychia* (Michx.) Fenzl in Endlicher, Gen. 958 (1840). Although most American botanists have retained *Anychia* as a genus, Mr. J. Francis Macbride, in 1915, entered an unpublished binomial for one of our species on a sheet in the Gray Herbarium and made the memorandum: "*Anychia* and *Anychiastrum* are not to be retained. Old World species [of *Paronychia*] show pedicelled perianths and the bracts of *Anychia*"; and in 1934 Pax & Hoffmann in Engler & Prantl, Nat. Pflanzenfam. ed. 2, xvi^{c}. 300 (1934) followed Fenzl in treating *Anychia* as a section of *Paronychia*. With this treatment I find myself in sympathy; consequently I am not able to follow Small in breaking *Anychia* into three genera.

[1] Standley, Proc. Biol. Soc. Wash. xxviii. 173 (1915).

In his Manual Small illustrates his ideas of generic differences in this series. *Anychia* has "Sepals with narrow margins, hooded and mucronate" and "Styles short, united" as contrasted with *Anychiastrum* Small with sepals "broad, with a wide hood at the apex and a short stubby mucro" and with "Styles elongate, united, separating and partly deciduous in age"; and *Nyachia* Small has "Sepals with broad wing-margins, hooded and with a thick umbo" and "Styles very short, distinct." Comparison of the illustrations on pages 480 and 481 of Small's Manual show the "short stubby mucro" of the sepals of *Anychiastrum* to be longer than and as sharp as in *Anychia* and the upper calyces of each series of drawings so similar as to be essentially inseparable, while the lower calyx under *Anychia* is so like both calyces under *Nyachia* that the reputed GENERIC differences are not evident. Furthermore, all three have the sepal-tip hooded or cucullate. If the degree of sharp-pointing is considered a generic difference, what shall we say about *Anychia canadensis* (L.) Ell. and *A. polygonoides* Raf., both included by Small under *Anychia,* while the very similar *A. divaricata* Raf. appears as *Anychiastrum montanum* Small? As originally described by Small (Torreya, x. 231) the sepals of the latter (FIGS. 9–11) are "abruptly pointed at the apex, . . . without prominent apical cusps." But in the most extreme form (FIG. 8) of *Anychia polygonoides* (*A. Nuttalli* Small) the sepals end in a positive awn or cusp 0.2 mm. long, while in *A. canadensis* the flat round-tipped sepals (FIG. 1) are even less mucronulate than in *Anychiastrum montanum.* As a stable GENERIC character the degree of pointing of the sepals is extremely weak.

Similarly with the styles. Although *Anychia* is separated from *Anychiastrum* by having "Styles short, united," as opposed to "elongate, united, separating . . . in age," the lower right-hand flower of *Anychia* in Small's Manual is shown with the 2 styles wholly distinct, as in *Nyachia.* Those who find clarity and intellectual stimulus in the recognition of such "genera" are free to do so; unless they further clarify them, however, they can hardly expect others to follow them. Personally, I agree with Pax & Hoffmann in reducing *Anychiastrum, Anychia* and *Nyachia* to *Paronychia.*

Paronychia § *Nyachia* (Small) Pax & Hoffm. l. c. (1934), based on *Nyachia* Small in Torreya, xxv. 11 (1925), consists of a single unique species from the sands of Florida. This is *Nyachia pulvinata* Small, which became *Paronychia pulvinata* (Small) Pax & Hoffm. l. c. The

latter name, however, is a later homonym, for Pax & Hoffmann overlooked the Rocky Mountain *P. pulvinata* Gray (1864). Under *Paronychia, Nyachia pulvinata* may become *P. chartacea.*[1]

Paronychia, § *Anychia* consists of two species. One of them, *P. canadensis* (L.) Wood, Class Bk. 1861: 262 (1861) at least as to type, *Queria canadensis* L., is a clear-cut species, with glabrous stems, capillary branches, thin elliptic leaves, very short stipules and stipular bracts, flat essentially ribless round-tipped sepals and much exserted subglobose capsules (FIG. 1) with distinct styles. The other species is usually coarser, the stem puberulent or minutely pilose, the leaves oblanceolate to narrowly obovate or narrowly elliptic, the stipules and stipular bracts attenuate and comparatively conspicuous, the sepals (FIGS. 2–8) usually corrugated (always so in age except sometimes in one variety), mucronulate- to subulate-tipped, the capsule included or barely exserted, obovoid, with the styles united at least below. This second species is the heteromorphic series now passing as *Anychia polygonoides* Raf. and *Anychiastrum montanum* Small.

Anychia polygonoides occurs in four geographic varieties:

Var. *a* (FIGS. 2–5). Stem stiffly erect or ascending, the older and larger plants with broad flabelliform outline, the branchlets rather densely flowering; leaves grayish-green, often minutely serrulate toward the sharp tip, those of the primary axis 1–2 cm. long; stipular bracts subtending the flowers lance-attenuate, shorter than the calyx; sepals definitely corrugated, with minute white mucronulate tips; styles united, much shorter than the ovary.—Massachusetts to Wisconsin, south to Florida and Texas.—Passing insensibly to var. *b* and through diffuse and greener plants to var. *d. Anychia polygonoides* Raf.

Var. *b* (FIGS. 6 and 7). Similar to var. *a;* stipular bracts equaling or overtopping the flowers.—Delaware and Pennsylvania to Illinois and Tennessee.

Var. *c* (FIG. 8). Similar to var. *a* or more depressed and divergently bushy-branched; sepals with subulate awns 0.2 mm. long.—Huntingdon, Adams and Franklin Cos., Pennsylvania. *Anchyia Nuttalli* Small.

Var. *d* (FIGS. 9–11). Diffusely to horizontally branched, forming low and intricate mats, greener; leaves barely if at all serrulate, the larger (primary) ones only 0.7–1.2 cm. long; stipular bracts ovate-

[1] PARONYCHIA **chartacea,** nom. nov. *Nyachia pulvinata* Small in Torreya, xxv. 12 (1925). *P. pulvinata* (Small) Pax & Hoffm. in Engler & Prantl. Pflanzenr. Aufl. 2, xvi^{c}. 300 (1934) not *P. pulvinata* Gray in Proc. Acad. Nat. Sci. Phila. for 1863: 58 (1864).

Photo. E. C. Ogden.

Varieties of Paronychia fastigiata, all figs. × 10: figs. 2–6, var. typica; figs. 6 and 7, var. paleacea; fig. 8, var. Nuttalli; figs. 9–11, var. pumila. Fig. 1, P. canadensis.

Photo. E. C. Ogden.

Varieties of Cassia nictitans, details × 4: fig. 1, var. hebecarpa, plant, × 1; fig. 2, leaf; fig. 3, surface of legume; fig. 4, surface of legume of C. nictitans; fig. 5, of var. leiocarpa.

lanceolate, shorter than to about equaling flowers; sepals less corrugated to plane, blunt, very minutely mucronulate; united styles nearly or quite as long as ovary.—Pennsylvania to Georgia and Alabama. *Anychiastrum montanum* Small.

That the first three varieties are variations of one species there is likely to be little question. The fourth (*Anychiastrum montanum*) is more remote from the others through its diffuse habit, greener and smaller foliage, broader stipular bracts, blunter and less corrugated sepals and longer style-column. But numerous plants with the characteristic gray-green foliage are diffuse and several of them have the style enough elongated to make a strong approach to typical *Anychiastrum montanum*, while such plants as *Hunnewell & Griscom*, no. 15,169 from Three-Top Mt., Shenandoah Co., Virginia, with the scarcely corrugated sepals (FIG. 11) and the long style of *Anychiastrum montanum*, has the ascending habit of typical *Anychia polygonoides* (my var. *a*). Furthermore, such a diffusely branched plant as *C. C. Deam's* no. 7540, from Clark Co., Indiana, with the habit and small green leaves of *Anychiastrum montanum*, has the corrugated sepals and the short style (FIG. 5) of var. *a*. Such specimens indicate that *Anychiastrum montanum*, in its best development, is only one of the extremes of a variable species. Incidentally, it has a number of names much earlier than that given by Small. These and the other names given to the pubescent-stemmed species will now be discussed.

In determining the proper names for these four varieties, we at once meet a familiar difficulty: Rafinesque proposed several species. The first series was published in Rafinesque's Atlantic Journal (1832) and included four species:

1. *Anychia Polygonoides*, Raf. discovered, 1818. Stem dichotomous, lax, erect, puberulent; leaves patent, linear cuneate, acute, nearly smooth, stipules lanceolate; flowers solitary in dichotomy, subpedicellate, erect. From the mountains Alleghany, and estival like the three following, six inches high.

2. *Anychia fastigiata*, Raf. disc. 1820. Stem dwarfish, erect, puberulent, subdichotome, fastigiate; leaves adpressed, linear cuneate, acute; flowers crowded, fastigiate, secund, subsessile. From Kentucky, one or two inches.

3. *Anychia conferta*, Raf. disc. 1821. Stem erect, dichotome, puberulent; leaves linear cuneate, acute, serrulate; flowers crowded, fastigiate, bracteate, pedunculate. From knobs of Kentucky, annual, three or four inches.

4. *Anychia lateralis*, Raf. disc. 1821. Stem procumbent, dichotome, divaricate; leaves remote, short, linear cuneate, entire; branchlets uni-

lateral; flowers sessile, lax or remote. Arid hills of Kentucky, one to three inches.[1]

In 1838 Rafinesque added somewhat to his characterizations of 1832, in the New Flora of North America, iv. 42 (1838). He had one additional name which concerns us:

835. ANYCHIA DIVARICATA R. stem decumbent puberulent very branched and divaricate, leaves oblong acute smooth, stipules ovate acute, flowers crowded striate sessile segments of calix nervose.—A very distinct sp. blended as usual with Queria or A. canadensis, branches so divaricate as to be sometimes almost reflexed, leaves 3 lines long one broad, flowers small quite crowded at the end of branchlets. Found from the Alleghany Mts. to Kentucky on hills, estival, stems spreading 6 to 10 inches.[2]

Anychia polygonoides, fastigiata and *conferta* are, with reasonable certainty, either my var. *a* or *b;* without mention by Rafinesque of the stipular bracts it is now impossible to say which. *A. lateralis* suggests my var. *d*, but it came from "arid hills of Kentucky," whence we do not know *Anychiastrum montanum*, and it might have been a habit-form of *Anychia polygonoides*. *Anychia divaricata* with its "branches so divaricate as to be sometimes almost reflexed" seems to be my var. *d* and in 1911 Steele[3] took up *Anychia divaricata* in this sense, gave a detailed and accurate[4] account of it and cited characteristic specimens. There is no question that *Anychia divaricata* Raf. *sensu* Steele is *Anychiastrum montanum*. After his very discerning discussion of *Anychia divaricata* Steele remarked: "I leave it to Doctor Small, who is already acquainted with this plant, to transfer it to Anychiastrum, if he sees fit." Small, however, had already (the year before) described the plant as a wholly new species of his *Anychiastrum*.

One other name must be considered. When Wood published the combination *Paronychia canadensis* (L.) Wood in 1861 for the upright plant with "style none," he defined a variety which is surely *A. divaricata* Raf. *sensu* Steele or *Anychiastrum montanum*. This variety of *Paronychia canadensis* was

β. PUMILA. Dwarf, a few inches (2–4′) high, the lvs. reduced in propor; tion, very pubescent; stems short-jointed, tufted, fls. sessile, glomerate-

[1] Raf. Atl. Journ. 16 (1832).

[2] Raf. New Fl. iv. 42 (1838).

[3] Steele, Contrib. U. S. Nat. Herb. xiii. 363 (1911).

[4] Steele slipped into one unfortunate inaccuracy, citing *Anychia divaricata* Raf. as published in "Neogenyton 4: 42. 1825." Neogenyton was published in 1825, but it consisted of only 4 pages and did not include *Anychia*. Steele was confused by the name given by Rafinesque to part iv. of his New Flora (1838); this part was designated by its author "Neobotanon."

style as long as the ovary (at least in specimens from Md. sent by Mr. H. Shriver).[1]

From among the early specific names of Rafinesque's, *Anychia polygonoides* has been selected and validated as applying to the common plant with flabelliform or fastigiate habit, pubescent stem, corrugated sepals and united styles. This name, however, cannot be taken over into *Paronychia* on account of *P. polygonoides* Muschler in Engl. Bot. Jahrb. xlv. 459 (1911). *A. fastigiata* and *A. conferta* were apparently conspecific with *A. polygonoides* (merely smaller plants) and I am, therefore, selecting the former of the two for retention. Since it is not now possible to determine with certainty whether Rafinesque had the variety with shorter or with longer stipular bracts I am applying his name to the wider-ranging and generally commoner var. *a*.

As I understand this complex species it should bear the following names. The characters are given on p. 418.

PARONYCHIA **fastigiata** (Raf.), comb. nov., var. **typica**. *Anychia fastigiata* Raf. Atl. Journ. 16 (1832). *A. polygonoides* Raf. l. c., not *Paronychia polygonoides* Muschler (1911). *A. conferta* Raf. l. c. Var. *a* of p. 418. FIGS. 2–5.

Var. **paleacea**, var. nov. (FIGS. 6 et 7), stipulis elongatis, bracteis stipularibus calyces aequantibus vel superantibus.—Delaware and Pennsylvania to Illinois and Tennessee. TYPE: dry soil, Mt. Cuba, Delaware, July 30, 1875, *A. Commons* in Gray Herb. (distributed as *A. canadensis*).

Var. **Nuttalli** (Small), comb. nov. *Anychia Nuttalli* Small in Torreya, xxv. 60 (1925).—Mountains of Pennsylvania. FIG. 8.

Var. **pumila** (Wood), comb. nov. *Anychia canadensis*, β. *pumila* Wood, Class Book, 1861: 263 (1861). *A. divaricata* Raf. New Fl. iv. 42 (1838) at least as interpreted by Steele, Contrib. U. S. Nat. Herb. xiii. 363 (1911). *Anychiastrum montanum* Small in Torreya, x. 230 (1910). *Plagidia montana* (Small) Nieuwl. in Am. Midl. Nat. iii. 115 (1913). *Paronychia montana* (Small) Pax & Hoffm. in Engl. & Prantl, Pflanzenr. Aufl. 2, xvi^{c}. 300 (1934). FIGS. 9–11.

SILENE CAROLINIANA Walt. PRINCESS ANNE COUNTY: sandy pine woods, scarce, Creed's, *F. & G.*, no. 4390.

Not listed by Kearney and evidently very local in southeastern Virginia.

CERATOPHYLLUM DEMERSUM L. PRINCESS ANNE COUNTY: in water at margin of Lake Joyce, *F. L. & F.*, no. 4638. SURRY COUNTY: margin of pond in cypress swamp, Sunken Meadow Beach, *F. & L.*, no. 6814.

[1] Wood, Class Book, 1861: 263 (1861).

Not listed by either Kearney or Erlanson; but presumably of wide dispersal in ponds and pools.

Ranunculus pusillus Poir. The following material is in the Gray Herbarium from the Coastal Plain of Virginia.—Elizabeth City County: pools at Hampton, May 12 and 13, 1877, *Thos. Morong;* marshy border of woods between Buckroe and Hampton, *B. L. Robinson,* no. 301. Princess Anne County: mud of wooded swamp, Oceana, *F. & G.,* no. 4393; pools in gum swamp, west of Pungo, *F. & G.,* no. 4394; border of gum swamp, Land of Promise, *F. & G.,* no. 4395; border of wet clay ditch, Virginia Beach, *F. & G.,* no. 4396. Norfolk County: alluvial woods near Cornland, *F. & G.,* no. 4397.

Not listed by Kearney nor Erlanson; but doubtless overlooked because of its early maturing, the plant being a quickly maturing annual or biennial which is completely disintegrated by early June.

*Ranunculus palmatus Ell. Norfolk County: ditch, Cedar Hill, *F. & G.,* no. 4398. Chesterfield County: wooded river-swamp along Appomattox River, near Hopewell, *F. L. & S.,* no. 5777.

First records from north of South Carolina.

Menispermum canadense L. Princess Anne County: rich woods, Great Neck, *F. & G.,* no. 4407.

Not listed by Kearney nor Erlanson.

Persea palustris (Raf.) Sarg. (*P. pubescens* (Pursh) Sarg.) Northampton County: low deciduous and mixed woods, Eastville, *F. & L.,* no. 5307; woods north of Cheriton, *R. R. Tatnall,* no. 1810.

Extension north from Cape Henry.

*Benzoin aestivale (L.) Nees, var. pubescens Palmer & Steyermark. Princess Anne County: rich dry woods, Great Neck, *F. & L.,* no. 4880. Chesterfield County: wooded river-swamp along Appomatox River, near Hopewell, *F. L. & S.,* no. 5780.

Although Palmer & Steyermark indicate the pubescent-leaved southern Spice Bush as extending north, in the East, only to South Carolina, it reaches New Jersey and eastern Pennsylvania.

Sanguinaria canadensis L., var. rotundifolia (Greene) Fedde. Princess Anne County: rich woods, Great Neck, *F. & G.,* no. 4411. Isle of Wight County: rich sandy and loamy wooded slope north of Walters, *F. G. & L.,* no. 6599, less characteristic.

Typical *Sanguinaria canadensis,* with the leaf becoming 1–2.8 dm. broad, the margins of the broad basal lobes and summits of the narrower ones coarsely dentate or crenate, occurs from eastern Quebec to Manitoba and North Dakota, southward to northern Florida,

Tennessee, Arkansas and Oklahoma. Southward it passes into the there more frequent var. *rotundifolia*, with mature leaves only 0.7–1.8 dm. broad, firmer, unlobed or lobed, the margin without dentations or barely undulate. This southern extreme reaches northeastward to New Jersey and Pennsylvania.

*CAPSELLA BURSA-PASTORIS (L.) Medic., var. BIFIDA Crépin. NORTHAMPTON COUNTY: common weed in cultivated field, Eastville, *F. & L.*, no. 5308.

A very marked variation, with large and deeply notched fruit.

DENTARIA LACINIATA Muhl. PRINCESS ANNE COUNTY: rich woods, Great Neck, *F. & G.*, no. 4413.

Listed by neither Kearney nor Erlanson.

AGRIMONIA PLATYCARPA Wallr. NORTHAMPTON COUNTY: dry sandy pine woods, Eastville, *F. & L.*, no. 5314; dry pine woods south of Kendall Grove, *F. L. & F.*, no. 5315. ISLE OF WIGHT COUNTY: rich sandy and loamy wooded slope north of Walters, *F. G. & L.*, no. 6606. SUSSEX COUNTY: sandy and loamy woods south of Pleasant Grove Church, *F. & L.*, no. 6225.

Not recorded by Kearney nor by Erlanson.

CASSIA NICTITANS L., var. **hebecarpa**, var. nov., (TAB. 448, FIGS. 1–3), caulibus laxe ramosis vel depressis; foliolis 10–15-jugis glabris vel ciliolatis valde approximatis 4–7 mm. longis; leguminibus villoso-hirsutis, villis divergentibus ad 1 mm. longis.—Coast of Virginia and North Carolina. VIRGINIA: crest of sandy and argillaceous bluff along Chesapeake Bay, Old Town Neck, Northampton Co., October 13, 1935, *Fernald, Long & Fogg*, no. 5316 (TYPE in Gray Herb., ISOTYPES in Herbs. Phil. Acad. and Univ. Pa.); NORTH CAROLINA: Elizabeth City, August 26, 1893, *Boettcher*, no. 291.

Typical *Cassia nictitans* has the surfaces of the legumes (FIG. 4) covered with minute incurved-appressed hairs and the longer and less approximate leaflets glabrous, the rachis either glabrous or appressed-pubescent. In its villous-hirsute legumes the newly proposed var. *hebecarpa* suggests var. *Mohrii* (Pollard) Macbr., but that more southern extreme has the leaf-surfaces positively pubescent.

On Pine Mountain in Bell County, Kentucky, Kearney collected the extreme in the series of variations of *Cassia nictitans*, the plant of Bell County having the legume quite glabrous. This extreme may be called

C. NICTITANS L., var. **leiocarpa**, var. nov. (TAB. 448, FIG. 5), leguminibus glabris.—KENTUCKY: Pine Mountain, Bell Co., September, 1893, *T. H. Kearney*, no. 496 (TYPE in Gray Herb.).

*Baptisia tinctoria (L.) R. Br., var. **Gibbesii** (Small), comb. nov. *B. Gibbesii* Small, Fl. Se. U. S. 599, 1331 (1903).

Although Small restricts his *Baptisia Gibbesii* to South Carolina, plants with the small fruits rounded at summit, instead of larger and tapering, are in the Gray Herbarium from scattered points on the Coastal Plain, from Georgia (dry pine woods near Belair, Richmond Co., *Harper*, no. 1315) to Rhode Island (Wickford, August 28, 1908, *G. G. Kennedy*).

The collections from Virginia indicate rather general occurrence. Northampton County: dry clearing bordering pine woods south of Kendall Grove, *F. L. & F.*, no. 5319. Princess Anne County: clay field near Lynnhaven, *F. G. & L.*, no. 4658. Prince George County: argillaceous and siliceous boggy depression north of Gary Church, *F. L. & S.*, no. 5804. Southampton County: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6227.

Although var. *Gibbesii* in extreme development is well marked, there are altogether too many transitional specimens to hold it specifically apart from the larger-fruited *B. tinctoria*.

Crotalaria sagittalis L. Frequent in sandy woods and clearings, Northampton, Elizabeth City, Prince George, and Sussex Counties.

The statement current in our manuals that *Crotalaria sagittalis* is annual is misleading. Northward and frequently southward it flowers as an annual, but in eastern Virginia it is more often a stout-based and obvious perennial.

Psoralea psoralioides (Walt.) Cory. (*P. pedunculata* (Mill.) Vail, not Poir.) Nansemond County: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4890; and frequent westward to the Fall Line.

Listed by Kearney only from North Carolina.

Wisteria frutescens (L.) Poir. Norfolk County: climbing high at border of gum swamp, near Cornland, *F. & G.*, no. 4438.

Not listed by Kearney nor Erlanson; first representative in the Gray Herbarium from Virginia. The species was recorded from Virginia by André Michaux in 1803, his record repeated by Pursh, Torrey & Gray and others. It is now certainly rare in the state.

Desmodium pauciflorum (Nutt.) DC. Princess Anne County: rich dry woods, Great Neck, *F. & L.*, no. 4893.

Not listed by Kearney.

D. rotundifolium (Michx.) DC. Elizabeth City County: bushy clearings and borders of woods west of Hampton, *F. L. & F.*,

no. 4897. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4896. Thence west to the Fall Line.

Not listed by Kearney.

D. PANICULATUM (L.) DC., var. PUBENS T. & G. PRINCESS ANNE COUNTY: open sands back of the dunes, Rifle Range, south of Rudy Inlet, *F. & L.*, no. 5901, growing with var. ANGUSTIFOLIUM T. & G. (var. *Chapmani* Britton), our no. 5900, a variety recorded by Kearney. ISLE OF WIGHT COUNTY: sandy pine and oak woods south of Zuni, *F. & L.*, no. 6615.

Not recorded by Kearney nor by Erlanson.

D. LINEATUM (Michx.) DC. NORTHAMPTON COUNTY: dry pine woods east of Eastville, *F. & L.*, no. 5330. PRINCESS ANNE COUNTY: dry argillaceous fields and bushy clearings, Rosemont, *F. & L.*, no. 4894; pine woods, Macon's Corner, *F. & L.*, no. 4895. Thence west to the Fall Line.

Noted by Kearney (as *Meibomia arenicola* Vail) only from Virginia Beach.

*LESPEDEZA STIPULACEA Maxim. Abundant by many roadsides from PRINCESS ANNE COUNTY (Cape Henry, *F. & G.*, no. 2836, as *L. striata*) inland at least to ISLE OF WIGHT COUNTY (Zuni, *F. & L.*, no. 6239) and north to STAFFORD COUNTY (Aquia Church, *F. L. & F.*, no. 4913).

Thoroughly naturalized.

RHYNCHOSIA ERECTA (Walt.) DC. NORTHAMPTON COUNTY: dry sandy pine woods, Eastville, *F. & L.*, no. 5339. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4922). Thence west to the Fall Line.

Not recorded by Kearney.

*OXALIS STRICTA L., forma **viridiflora** (Hus), comb. nov. *Oxalis stricta viridiflora* Hus in Mo. Bot. Gard. Ann. Rep. xviii. 99 (1907). VIRGINIA: open sandy border of roadside ditch, Savage Neck, Northampton Co., October 11, 1935, *Fernald & Long*, no. 5341.

The form of *Oxalis stricta* with green petals appears sporadically through the range of the species and should rank as a *forma* rather than as a geographic variety, the variations to which the term *varietas* is more and more restricted. When he published it with a trinomial Hus spoke of it as a variety; and it has so been treated by other writers.

ZANTHOXYLUM CLAVA-HERCULIS L. NORTHAMPTON COUNTY: sandy and argillaceous bluff and upper border of beach, Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5342.

Extension north from Cape Henry. A beautifully developed colony of trees.

*Melia Azedarach L. Northampton County: many fruiting trees, border of pine woods north of Kendall Grove, *F. L. & F.*, no. 5357. Southampton County: border of wooded bottomland of Meherrin River, above Haley's Bridge, *F. L. & S.*, no. 5820.

Generally cultivated as China Berry or "Mahogany"; now naturalized through seeding from old trees. Small (Man.) gives the northeastern limit as North Carolina. Kearney listed the species as "perhaps planted" and Erlanson's record of a "Flourishing tree in Williamsburg" is inconclusive.

Polygala Curtissii Gray. Nansemond County: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4925. Thence common westward and northwestward to the Fall Line.

Not listed by Kearney nor Erlanson.

P. cruciata L. Northampton County: boggy swale bordering swampy woods, south of Kendall Grove, *F. L. & F.*, no. 5347. Sussex County: Waverly, *A. B. Seymour*, no. 8. Southampton County: sandy border of wooded swamp about 3 miles northwest of Ivor, *F. & L.*, no. 6262.

Noted by Erlanson only from Henrico County; evidently local.

Euphorbia obtusata Pursh. Princess Anne County: roadside, Land of Promise, *F. & G.*, no. 4446. Henrico County: cultivated field, May 13, 1911, *J. R. Churchill.* Southampton County: wooded bottomland of Meherrin River, above Haley's Bridge, *F. L. & S.*, no. 5830.

Not listed by either Kearney or Erlanson.

Ilex vomitoria L. Northampton County: south shore of Old Plantation Creek, 4 miles south-southwest of Bayview, *R. R. Tatnall*, no. 1796; peaty clearing south of Townsend, *F. L. & F.*, no. 5354.

Extension north from Princess Anne County.

*Vitis cinerea Engelm., var. floridana Munson in Rev. de Vitic. vi. 424 (1896). *V. Simpsoni* Munson in Proc. Soc. Prom. Agr. Sci. viii. 59 (1887); Small, Man. Se. Fl. 838 (1933); Bailey, Gentes Herb. iii. 205 (1934). *V. austrina* Small, Fl. Se. U. S. 775, 1334 (1903).—Common and very conspicuous, climbing high in alluvial woods and wooded swamps of southeastern Virginia. The following specimens, representative of many stations, have been collected. Elizabeth City County: thickets, Buckroe, *B. L. Robinson*, no. 348, as *V. aestivalis.* New Kent County: thicket by Chickahominy River, near Providence Forge, *F. G. & L.*, no. 6635. Prince George County: river-swamp of Blackwater River, north of Disputanta,

F. L. & S., no. 5842. GREENSVILLE COUNTY: sandy alluvium, bottomlands of Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6634. NANSEMOND COUNTY: border of inundated cypress swamp along Somerton Creek, Factory Hill, *F. & L.*, no. 6831. NORFOLK COUNTY: Portsmouth, *Rugel*, specimen marked by Engelmann "*Vitis aestivalis* foliis indivisis" and by Bailey "*V. aestivalis*"; border of woods, northeast of Northwest, *F. G. & L.*, no. 4673. PRINCESS ANNE COUNTY: border of gum swamp, Oceana, *F. G. & L.*, no. 4672; rich woods, Cedar Island, *F. G. & L.*, no. 4674.

In Gray's Synoptical Flora, i. fasc. 2: 425 (1897) Bailey cited *Vitis cinerea* var. *floridana* only from "Manatee Co., Florida, and apparently also in Arkansas" and separated it, as had Munson in 1896, from *V. cinerea* with "ash-gray leaves and the gray tomentum of the young growth" by its "Growing tips rusty-tomentose, as are sometimes the veins on the under sides of the leaves; cluster longer-peduncled and more compound." *V. cinerea*, a wide-ranging species of the Mississippi Basin and Gulf Coastal Plain, was cited as coming east to northern Florida. In his Manual Small admits *V. cinerea* for Florida and cites *V. Simpsoni* as occurring only on that peninsula. In his latest consideration of the group, his *Species of Grapes peculiar to North America*, Gentes Herbarum, iii. fasc. iv. (1934), Bailey elevates *V. Simpsoni* to specific rank (with *V. cinerea*, var. *floridana* correctly cited as a synonym), with the range "Southern Georgia and Florida according to Munson; I have a specimen . . . ticketed as native in southeastern Arkansas . . . I have seen it at Augusta, Georgia and southward . . . ; to be expected in the Carolinas." Not only is this characteristic *Vitis* "to be expected in the Carolinas"; in the Gray Herbarium it is well represented by thoroughly characteristic material from SOUTH CAROLINA (rich woods, Abbeville District, June, 1855, *Hexamer & Maier;* Santee Canal, *Ravenel;* both identified by Bailey as *V. aestivalis*) and from NORTH CAROLINA (thicket along edge of swamp, Edenton, *L. F. & F. R. Randolph*, no. 611, as *V. aestivalis*). In southeastern Virginia it abounds and "strikes one in the eye" through its rufescent shoots with the characteristically uncleft and long-tipped blades projecting over the roads from many or most rich swampy woodlands. Thoroughly characteristic plants of it can be seen clambering over the trees in a moist depression near the Biological Laboratories of the University of Richmond.

When Mr. Long and I called the attention of our hosts, Professors John W. Bailey and Robert F. Smart to this conspicuous climber,

unrecorded from north of southern Georgia, Professor Bailey promptly responded: "Why, that's Pigeon Grape. It grows everywhere in the lower Mississippi Valley." He was essentially correct. The only shadow of difference I can find to separate var. *floridana* from *V. cinerea* is its rufescence. The tendrils and foliage are otherwise identical, the thyrse, whether in flower or fruit, shows quite parallel variation and the length of the peduncle, emphasized by Bailey, gives me nothing diagnostic. The stones of ripe fruits collected by Long and me in mid-October exactly match those of material from Engelmann himself of his *V. cinerea.* It is significant that Munson, whose experience with southern grapes was unequaled, abandoned *V. Simpsoni* as a species and treated it as *V. cinerea,* var. *floridana.* Two sheets of Simpson's material sent by Munson to the Gray Harbarium are important. They were originally labeled by him *Vitis Simpsoni,* "Rusty Winter Grape" or "Rusty Cinerea." On one sheet Munson, on September 24, 1889, wrote "should be only a variety of *V. cinerea.* T. V. M. 9/24 '89." On the other sheet he crossed out the name *V. Simpsoni* and substituted "*V. cinerea,* var."

Until something more positive than rufescence (which is often not very obvious) instead of cinereousness is put forward I am unable to maintain *Vitis Simpsoni* as a species.[1] But as a variety of the wide-ranging *V. cinerea* of the Mississippi Basin and Gulf Coastal Plain it is most interesting. The occurrence of types largely developed in the latter regions but with continuous or even quite isolated or restricted areas on the Atlantic Coastal Plain is becoming more and more apparent. This *Vitis* is another case in point.

Stewartia Malachodendron L. Two Virginia sheets are in the Gray Herbarium, one from Accomac County, 1886, *Ellis Mears;* the other from Norfolk County, *F. & G.,* no. 4455.

[1] Nor am I able to treat as distinct species *Vitis aestivalis* Michx. (1803) and *V. argentifolia* Munson (1887), the plant which has been passing, erroneously as shown by Bailey, l. c. 197, as *V. bicolor* LeConte, not Raf. Every field-botanist I have known, who is familiar with the two from southern New England to Pennsylvania and Virginia, has expressed the view that *V. argentifolia* ("*V. bicolor*") is merely a less rufescent and more glaucous and glabrate-leaved northern, inland and upland variety of the more pubescent and more rufescent *V. aestivalis,* which, in the northern half of its range, occurs at low altitudes. The name, *V. aestivalis,* var. *bicolor,* incorrectly ascribed by Britton & Brown, Ill. Fl. ii. 409 (1897) to "LeConte, Wats. & Coult. in A. Gray, Man. Ed. 6, 113. 1890," can not be used, in the first place because our plant is not *V. bicolor* LeConte, in the second place because neither LeConte nor Watson & Coulter ever published a *V. aestivalis,* var. *bicolor.* The combination was made by Britton & Brown in synonymy. The smoother and glaucous plant is Vitis aestivalis Michx., var. **argentifolia** (Munson), comb. nov. *V. argentifolia* Munson in Proc. Soc. Prom. Agr. Sci. viii. 59 (1887).

It is wiser not to publish the exact localities. Too many people, and among them many botanists, will immediately dig up and take home to die mature or old individuals of rare and local plants, which, left undisturbed in their natural haunts, would survive for future generations, If people lack consideration for others it is better not to show them rare plants. *Stewartia Malachodendron* is now very rare in Virginia (or elsewhere), doubtless due to removal of shrubs for their beautiful flowers. The species was sent from Virginia to the Earl of Bute (Stuart or Stewart) and others, who were cultivating it as early as 1741. In that year, in his *Decem Plantarum Genera,* Linnaeus described it as *Stewartia* (with the plate referred to as *Stevartia*) from material derived from Virginia, the plate drawn by Ehret ("Icon plantae manu Ehretii"), and he stated that dried specimens had been sent by John Clayton to Gronovius. In 1743 or 1748, in Marc Catesby's *Natural History of Carolina,* etc. Append. 13, t. 13, it was proposed as a new genus *Steuartia.* As to the date of this publication, Pfeiffer, Nomenclator, gives 1743, but the copy of it at the Museum of Comparative Zoology at Harvard contains the penciled memorandum that it came out in 1748. The latter date, as will be shown, is probably correct. Catesby said "For this elegant plant I am obliged to my good friend *Mr. Clayton,* who sent it me from *Virginia,* and three months after its arrival it blossomed in my garden at *Fulham,* in *May* 1742." Of importance in establishing the date is a letter from John Mitchell quoted by Catesby:

SIR,

The Plant which you shewed me by the name of *Steuartia,* I take to be a new genus of Plants, the same that I called *Malachodendron.*

This item is significant, for in his *Plantarum quaedam Genera recens condita et in Virginia observata* (1748), with no mention of Catesby, Mitchell published his *Malachodendron,* whence Linnaeus derived his specific epithet. He would hardly have written to Catesby in 1742 or 1743 of the plant "that I called *Malachodendron*" five years or more before he published it.

Catesby, calling the shrub *Steuartia,* not mentioning Linnaeus's *Stewartia* of 1741 and implying the publication of a brand new genus, said: "The Right honourable and ingenious Earl of *Bute* will, I hope, excuse my calling this new genus of Plants after his name." Catesby's beautiful colored plate represents a branch with four expanded flowers, an opened capsule and freed seed, a bird called *Regulus cristatus* and a waspish insect called *Vespa Ichneumon.* This plate,

signed "MC," has the air of originality. Nevertheless, the Ehret plate published by Linnaeus in 1741, "G. D. Ehret delin.," is so like the upper half of the Catesby plate of 1748 (but in black and white), with the drawings of the capsule and seed only slightly different, that the two plates obviously originated with one artist!

In Catesby's original account (1748) the generic name was spelled *Steuartia.* This was repeated in the edition revised by George Edwards, in 1754. But in an edition of 1771, with the Appendix numbered consecutively with vol. ii, page 13 and plate 13 of the original and the 1754 editions becoming page 113 and plate 113, the name was altered to *Stuartia.* Linnaeus, however, in 1753, our starting point, held to his own *Stewartia.*

The Varieties of Ascyrum Hypericoides. *Ascyrum Hypericoides* L. has long been recognized as a polymorphic species and many binomials have been proposed for forms within its specific bounds. On the other hand, Coulter, after maintaining[1] two species, *A. Crux-Andreae* L. and *A. Hypericoides* L., gave up the separation and united all the forms as *A. Hypericoides,* saying "they cannot be separated even varietally . . . and the attempt to maintain two distinct species seems untenable. In any event, the North American plant should bear its original Linnaean name."[2]

Our experience in eastern Virginia indicated that some recognition of geographic varieties is desirable. The commoner plant of the Coastal Plain there has tall and erect or strongly ascending stems up to 9 dm. high and usually unbranched or only sparsely branched at base, but with flowering branches from most of the middle and upper axils; with the primary leaves oblong-oblanceolate, 2–3 cm. long by 5–9 mm. broad; the outer sepals broadly ovate and commonly subcordate, in maturity 10–15 mm. long by 7–10 mm. broad. This tall shrubby plant is characteristic of pine woods and borders of mixed or deciduous woods in the easternmost counties (Princess Anne, Norfolk, Northampton and Accomac), extending inland at least across the Coastal Plain; and, although most material has accumulated from eastern Virginia, this coarsest Coastal Plain extreme is represented by occasional specimens from south to Florida, west to Mississippi, inland to Tennessee and Missouri and north to Worcester County, Maryland.

[1] Coulter in Bot. Gaz. xi. 80, 81 (1886).
[2] Coulter in Gray, Syn. Fl. N. Am. i. 283 (1897).

Much less common in easternmost Virginia is the low, suffruticose plant which extends northward to New Jersey and Nantucket and which ranges broadly through the southern states. In this extreme the suffruticose stem reclines or spreads into low diffuse mats with the new flowering branches 1–2 (rarely –3) dm. long; its larger oblong-oblanceolate leaves are 1–2.3 cm. long by 4–9 mm. wide; the outer sepals elliptic, oval or oblong-ovate and rounded at base, 5–11 mm. long by 3–7 mm. broad. This smaller, lower and diffuse plant was not seen by us in Princess Anne and Norfolk Counties, but we got it in Nansemond, York and Northampton, and in the counties immediately westward and it is represented in the Gray Herbarium from many counties across the state quite to its westernmost border (ascending to 3500 feet).

Extending from Virginia to Florida and the West Indies, westward to Texas and Mexico there is a third extreme, a shrub often as tall as the largest extreme of the series but with leaves linear-oblong or linear-oblanceolate, with crowded axillary fascicles and undeveloped branchlets. In this most southern extreme the principal leaves are 0.5–2 cm. long but only 2–4 (rarely –5) mm. wide; its larger sepals vary from oblong-elliptic to ovate, 5–11 mm. long by 3–5 mm. broad.

Although conspicuously different in their extremes, these three strong trends merge in all characters. I have vainly sought for any satisfactory characters in capsules and seeds and I am forced to the conclusion reached by Coulter, that they are not specifically separable. As already noted, however, I feel that they should be designated as well marked geographic varieties.

As first published by Linnaeus, Sp. Pl. 787 (1753), *Ascyrum* consisted of three species, two of which concern us. The first was *A. Crux-Andreae*, based on *Hypericoides ex terra mariana, floribus exiguis luteis* of Plukenet, "which plant proves upon inspection to be Hypericum mutilum L.!"—Torr. & Gray, Fl. N. Am. i. 672 (1840). Subsequently Linnaeus altered his conception of *A. Crux-Andreae*, in Sp. Pl. ed. 2: 1107 (1763) by taking from his citations under his original *A. Hypericoides* a Gronovian reference to the wide-spread low plant of the United States and transferring it to *A. Crux-Andreae*. In this revised sense Torrey & Gray and many later authors took up the latter name, but such a procedure is no longer justified, since *A. Crux-Andreae* of ed. 1 was merely *Hypericum mutilum*.

Ascyrum Hypericoides of L. Sp. ed. 1 was a mixture, which was

clearly discussed by Torrey & Gray. Said to come from Virginia, it rested partly upon the Virginian plant of Gronovius, which in the 2d edition Linnaeus transferred to *A. Crux-Andreae,* in part upon a Clifford specimen (not now preserved), in part upon *Hypericoides frutescens erecta* of Plumier (the narrow-leaved West Indian plant) and in part upon a Plukenet plant which is *A. stans* Michx.; certainly a most confused concept. By removing in his 2d edition the Gronovian plant and by deliberately adding to the citations under *A. Hypericoides* Patrick Browne's Jamaican shrub with "foliis linearibus," to which he gave priority of place, Linnaeus established the fact that he ultimately intended principally the linear-leaved shrub of the West Indies. In his monographic and very discerning study of the *Hypericaceae, Prodromus d'une Monographie de la Famille des Hypéricinées* (1820), Choisy (p. 61) thus interpreted *A. Hypericoides* and he was followed in the still more extensive but less discerning monograph of Spach.[1] It seems right to follow this interpretation. Spach, however, distinguished the continental plant with linear leaves from the West Indian as *A. linifolium* but the two seem scarcely separable.

The low and matted or diffuse half-shrub of wide range, extending north to southeastern Massachusetts, was first clearly designated as *Ascyrum multicaule* Michx. Fl. Bor.-Am. ii. 77 (1803). Spach gave it several names and it has recently passed on the continent of North America as typical *A. Hypericoides.*

The tall and largest extreme, which occurs from Florida to Mississippi northward on the Coastal Plain to Maryland and inland from Mississippi to the low country of western Tennessee (Carroll Co.) and southeastern Missouri (Dunklin Co.), seems to be *Ascyrum oblongifolium* Spach, Hist. Nat. Vég. v. 461 (1836). His "Plante très-semblable à l'espèce précédente par le porte, mais plus grande dans toutes ses parties. Rameaux inférieurs munis de ramules florifères à presque toutes les aisselles . . . Feuilles en general 2 fois plus grandes que celles de l'espèce précédente" are points which indicate this identity.

As I understand *Ascyrum Hypericoides,* it consists of the following leading varieties.

ASCYRUM HYPERICOIDES, var. **typicum**. *A. Hypericoides* L. Sp. Pl. 788 (1753) as to Plumier's plant (*Hypericoides frutescens erecta, flore luteo*), ed. 2: ii. 1108 (1763); Spach, Hist. Nat. Vég. v. 458 (1836). *A. Crux-Andreae,* β. *angustifolium* Nutt. Gen. ii. 16 (1818). *A. lini-*

[1] Spach, Hist. Nat. Vég. v. 458 (1836).

folium Spach, Hist. Nat. Vég. v. 459 (1836).—Ascending shrub with very crowded linear-oblong to linear-oblanceolate leaves, with numerous axillary fascicles and short sterile branchlets; larger leaves 0.5–2 cm. long, 2–4 (–5) mm. wide; larger sepals oblong-elliptic to ovate, 5–11 mm. long, 3.5–9 mm. wide.—West Indies and Florida to Texas and Mexico, north to Bermuda, Virginia and Tennessee.

I have seen no thoroughly characteristic material from Virginia but Choisy, Prodr. Monogr. Hypéric. 61 (1821), under his *A. Crux-Andreae*, β. "foliis oblongo-linearibus angustioribus" (based upon Nuttall's variety), cited it "E Virginiâ (v. s. sp. in h. D. C.)." Much of the material from the inner Coastal Plain of Virginia is transitional between var. *typicum* and var. *oblongifolium*, and *Fernald & Long*, no. 6275, from south of Zuni, Isle of Wight County, is a near approach to var. *typicum*.

Var. **multicaule** (Michx.), comb. nov. *A. multicaule* Michx. Fl. Bor.-Am. ii. 77 (1803). *A. helianthemifolium* Spach, Hist. Nat. Vég. v. 460 (1836). *A. spathulatum* Spach, l. c. 462 (1836). *A. Crux-Andreae* sensu Torr. & Gray, Fl. i. 156 (1838), 672 (1840) and subsequent auth., not L. Sp. Pl. i. 787 (1753).—Low and diffuse or matted, the slender ascending leafy branches 1–2 (–3) dm. long, flowering from the tips and the uppermost axils; larger leaves oblong-oblanceolate, 1–2.3 cm. long, 4–9 mm. broad; outer sepals elliptic, oval or oblong-oblanceolate, rounded at base, 5–11 mm. long, 3–7 mm. broad.—Georgia to eastern Texas, north to Nantucket Island, Massachusetts, New Jersey, Pennsylvania, District of Columbia, West Virginia, Kentucky, southern Illinois, Missouri and Kansas.

Var. **oblongifolium** (Spach), comb. nov. *A. oblongifolium* Spach, Hist. Nat. Vég. v. 461 (1836).—Stems erect or ascending, solitary or few, 3–9 dm. high, simple or but sparsely branched at base, with flowering (often quite elongate) branches from most of the middle and upper axils; leaves oblong-oblanceolate, the primary ones in distant pairs, the larger 2–3 cm. long, 5–9 mm. broad; outer sepals broadly ovate, usually cordate or subcordate at base, 10–15 mm. long, 7–10 mm. broad.—Coastal Plain, Florida to Mississippi, north to eastern Maryland, western Tennessee and southeastern Missouri.

THE VARIETIES OF HYPERICUM § ELODEA. The Marsh St. Johnsworts consist of two clearly defined species, *Hypericum virginicum* L. and *H. petiolatum* Walt., the former wide-ranging from Florida to Newfoundland and eastern Canada, thence westward to Manitoba and Nebraska, the latter typical of cypress- or gum-swamps of the South. A third plant, somewhat intermediate in aspect, in having sessile instead of petioled leaves but with the floral characters of *H. petiolatum*, occurs from Florida to Louisiana and northward into

southern Virginia, southern Ohio, southern Indiana and Missouri. This is *H. tubulosum* Walt. (1788), *Elodea Drummondii* Spach (1836) and *Triadenum longifolium* Small (1898).

The southern material of *Hypericum virginicum* has the mature (fruiting) styles 2–3 mm. long, continuing the gradually tapering capsule, and the mature sepals lanceolate, acute and 5–7 mm. long. This plant occurs from Florida north on the Coastal Plain and in the Piedmont to the lower altitudes of New England and Nova Scotia, inland to Ohio. The more northern material, from Newfoundland and the southern slope of the Labrador Peninsula to Manitoba, Minnesota and Nebraska, all has shorter styles, when mature only 0.5–1 (–2) mm. long, the capsule often plumper and more rounded at summit, though sometimes attenuate, the mature sepals usually oblong or elliptic and rounded or blunt at tip and only 2.5–5 mm. long. The seeds of the northern series average minutely longer than in the southern and in color they are commonly paler and their reticulation is a little fainter; but these characters break in a long series and so many of the long-styled plants have blunt sepals, so many of the short-styled have them acute that I cannot find the constancy I look for in true species. In foliage, too, the two exactly resemble one another. I am, therefore, looking upon them as two very well defined geographic varieties, the long-styled southern and coastwise plant with lanceolate acute sepals being typical *H. virginicum*, which was described by Linnaeus from Pennsylvania and which had the "Calyx *acutus*."

The northern extreme was beautifully described from Canadian specimens as *Elodea Fraseri* Spach in Ann. Sci. Nat. sér. 2, v. Bot. 168 (1836): "sepalis ellipticis vel oblongis, obtusis; . . . stylis (sub anthesi) ovario subduplo brevioribus." As a northern variety it becomes

Hypericum virginicum L., var. **Fraseri** (Spach), comb. nov. *Elodea Fraseri* Spach in Ann. Sci. Nat. sér. 2, v. Bot. 168 (1836).—Newfoundland and Canadian Labrador to Manitoba, south to Nova Scotia, northeastern and central Massachusetts, Connecticut, central Pennsylvania, northern Indiana, northern Illinois, Iowa and Nebraska.

As shown in the Gray Herbarium and the Herbarium of the New England Botanical Club, all material from Florida to New Jersey and all from Rhode Island belongs to typical *Hypericum virginicum;* furthermore, all specimens from Newfoundland, the Labrador Peninsula, Quebec, Magdalen Islands, Prince Edward Island, New Bruns-

wick, Ontario, Vermont, Michigan, Indiana, Minnesota, Iowa and Nebraska are var. *Fraseri*. In Nova Scotia, Maine, New Hampshire, Massachusetts, Connecticut, New York and Pennsylvania both varieties are found, but they there usually show clear segregation into southern or lowland and northern or upland series. In Nova Scotia, with its well known admixture of Canadio-Alleghenian and Coastal Plain floras, both are common, but in several counties with little or no development of Coastal Plain plants (Victoria, Pictou, Colchester, Cumberland, and Halifax and on Sable Island) only var. *Fraseri* has been collected. In Maine the long-styled typical *H. virginicum* is in the southern and coastal counties, extending inland to southern Penobscot, Kennebec and Androscoggin; but var. *Fraseri* alone is in the northern three-fourths of the state, extending more locally into the southern counties. In New Hampshire typical *H. virginicum* is in the southern counties (Rockingham, Merrimac and Cheshire), var. *Fraseri* extending over the state. From Massachusetts nearly all the collections are of typical *H. virginicum*, but var. *Fraseri* is represented from the extreme northeastern corner of the state and from the upland of Worcester County. Similarly, from Connecticut most specimens are of typical *H. virginicum*, but var. *Fraseri* is represented from Franklin and Waterbury. The representation from New York and Pennsylvania is too small for generalization, but typical *H. virginicum* extends inland at least to Washington, Chenango and Seneca Counties, New York, with var. *Fraseri* south at least to Washington, Oneida and Cortland Counties. From eastern Pennsylvania all the material is typical *H. virginicum*, the var. *Fraseri* being in the Gray Herbarium only from Center County.

As stated in the first paragraph, the plant recently proposed as a new species, *Triadenum longifolium* Small in Bull. Torr. Bot. Cl. xxv. 140 (1898) (as *T. longifolia*), was well characterized by Walter at the time he published his *Hypericum petiolatum*. Walter recognized three species of this section:

**Stamina in 3 phalangibus. Flores rubescentes. Glandulae inter phalanges.

campanulatum 9. floribus trigynis, pedunculis trifidis axillaribus oppositis, corollis *campanulatis patulis, staminibus laevissime basi coalitis,* foliis oblongis obtusis sessilibus.

tubulosum 10. floribus trigynis, *corollis tubulosis,* staminum corporibus plusquam ad medium connatis, foliis sessilibus.

petiolatum 11. floribus trigynis, staminum corporibus ad medium usque connatis, *foliis petiolatis.*[1]

[1] Walt. Fl. Carol. 191 (1788).

Walter's *Hypericum campanulatum* was, obviously, *H. virginicum* L.; his *H. petiolatum* was, as obviously, the plant generally so called; his *H. tubulosum* differed from the latter by the very character used by Small in his Manual to distinguish his own *Triadenum longifolium;* "Leaf-blades sessile, truncate or subcordate at base." In the series of *H. petiolatum* in the Gray Herbarium there is great diversity, some plants showing petioles 1.5 cm. long, others up to 1 cm., still others only 0.5 cm., and still others only 2 or 3 mm. Rugel's material in the Gray Herbarium, bearing the data quoted by Small for the type of his *Triadenum longifolium,* has the lower and median leaves quite like those of *H. petiolatum* except for their lack of petioles. In the series before me it is possible to go from plants with sessile and basally narrowed leaves to those with most of them subamplexicaul. Bush's no. 6312 from Campbell, Missouri and Hale's material from Louisiana have the several upper pairs of leaves with broadly rounded to sub-clasping bases. I can find no floral differences. On the bottomlands of the Nottoway River in Greensville County, Virginia, Mr. Bayard Long and I had the opportunity to compare them side-by-side. The flowers were essentially alike, both with *recurving* small petals. I am, therefore, calling the sessile-leaved plant

Hypericum petiolatum Walt., var. **tubulosum** (Walt.), comb. nov. *H. tubulosum* Walt. Fl. Carol. 191 (1788). *Elodea Drummondii* Spach in Ann. Sci. Nat. sér. 2, v. Bot. 167 (1836)—"foliis . . . caulinis rameisque inferioribus oblongo-spathulatis, sessilibus; superioribus ovalibus vel oblongis, amplexicaulibus, basi cordatis." *Triadenum longifolium* Small in Bull. Torr. Bot. Cl. xxv. 40 (1898).

Small, in his original publication of *Triadenum longifolium,* said "The sepals are lanceolate and acuminate, as contrasted with the oblong, obtuse sepals of *T. petiolatum.*" To some extent the difference in sepal-shape parallels that in the two extremes of *Hypericum virginicum;* in the isotype in the Gray Herbarium of *T. longifolium* the sepals are the narrowest and most attenuate I have seen, but in the Bush material, above cited, from Campbell, Missouri, a plant with the foliage-characters of most extreme *T. longifolium,* the sepals are as broad and as blunt as in the best *H. petiolatum.*

Viola Stoneana House. Princess Anne County: rich dry woods, Little Neck, *F. G. & L.,* no. 4677.

Apparently the southern limit.

*V. esculenta Ell. Norfolk County: dry roadside bank, near Gertie, *F. & G.,* no. 4465.

First from north of South Carolina.

*V. AFFINIS Le Conte, var. LANGLOISII (Greene) Griscom. NORFOLK COUNTY: sandy bank, east of North Landing, *F. & G.*, no. 4457.

First from north of northern Florida.

V. SAGITTATA Ait. PRINCESS ANNE COUNTY: clay of roadside, east of Little Creek, *F. & G.*, no. 4464.

Not noted by Kearney.

*AMMANNIA KOEHNEI Britton, var. **exauriculata,** var. nov. (TAB. 449, FIGS. 4 et 5), planta perennis basi prolongato decumbenti; foliis spathulatis vel late oblanceolatis omnibus basi attenuatis vel angustatis, superioribus nec basi dilatato-subcordatis; petalis nullis.—VIRGINIA: fresh to brackish swales along North Landing River, near Creed's, Princess Anne County, September 9, 1935, *Fernald, Long & Fogg*, no. 4954 (TYPE in Gray Herb., ISOTYPES in Herbs. Phil. Acad. and Univ. Penn.).

Var. *exauriculata* is a very extreme departure from typical *Ammannia Koehnei* in having all the leaves narrowed to base (FIG. 5) and in having a prolonged and decumbent base (FIG. 4). Typical *A. Koehnei* (FIGS. 1 and 2) has the erect or ascending stem rising directly from the annual base and its upper leaves are auriculate or subcordate-clasping (FIG. 3). Although the wide-ranging plant sometimes has small petals, they are, as originally described by Britton, "fugacious," so much so that it is an exceptional plant which displays them. Our material seems to be quite apetalous, but it is so mature that petals, if they occurred, would have fallen. I get no difference of calyx and seeds between the two. I am consequently treating the plant of North Landing River as a variety. The typical annual *A. Koehnei* is 0.8–5 dm. high; the loosely ascending or reclining leafy stems of var. *exauriculata* are 2.5–7 dm. long.

North of Florida typical *Ammannia Koehnei* is a very localized plant. I have before me all the material in the Herbarium of the New York Botanical Garden, kindly sent by Dr. Gleason. This, with the representation in the Gray Herbarium, comes from the following scattered stations:

NEW JERSEY: Hackensack Marshes, *Torrey, Leggett.*

VIRGINIA: tidal marsh, Carter's Creek, at south shore of York River, *Grimes*, no. 4271.

NORTH CAROLINA: sand banks near Beaufort, *I. F. Lewis*, no. 189; "Sea islands," *M. A. Curtis.*

FLORIDA: shores of river near Jacksonville, *Curtiss*, no. 5133; shores and ditches, Indian River, *Curtiss*, no. 949; Titusville, *Nash*,

no. 2288; swamps, Okeechobee region, Brevard County, *Fredholm*, no. 5982; sandy shore, Orange County, *Fredholm*, no. 5426; pinelands near Felsmere, *Small*, no. 8881; pineland, Fort Myers, *J. F. Standley*, no. 392; Terra Ceia Island, *Simpson*, no. 407; Key West, *Blodgett*.
Mississippi: Heron Island, *Tracy*, no. 6424.

Ludwigia glandulosa Walt. Recorded in Rhodora, xxxvii. 433 (1935) from a single station in Norfolk County, the first record from north of South Carolina. Now known to be frequent from Princess Anne County westward to the Fall Line. The following specimens are before me. Princess Anne County: wet argillaceous thickets and ditches, Rosemont, *F. & L.*, no. 4960. Nansemond County: roadside ditch at border of woods, Magnolia, *F. L. & F.*, no. 4963. Southampton County: argillaceous ditch south of Sebrell, *F. & L.*, no. 6309. Greensville County: sandy alluvium, bottomlands of Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6653. Prince George County: swampy clearing near Gary Church, *F. & L.*, no. 6307; alluvial woods of Second Swamp, north of Baxter Crossing, *F. & L.*, no. 6308. New Kent County: ditches near Providence Forge, *F. G. & L.*, no. 6654, the northernmost recorded station.

*L. alata Ell. Princess Anne County: fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4960.

First from north of North Carolina.

L. brevipes (Long) E. H. Eames. Additional station in Princess Anne County: peaty margin of cove, southern end of Lake Joyce, *F. L. & F.*, no. 4964.

*L. palustris (L.) Ell., var. nana Fern. & Grisc. in Rhodora, xxxvii. 176, t. 349, figs. 6 and 10 (1935). Accomac County: depression in clearing in pine woods, 3½ miles north of Accomac, *F. L. & F.*, no. 5390. Prince George County: swampy clearing near Gary Church, *F. & L.*, no. 6310. Sussex County: water-hole in sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6311. Noticed but not collected at numerous stations from Prince George, Sussex and Southampton Counties to Nansemond County.

Extension north from southern Georgia.

Myriophyllum pinnatum (Walt.) BSP. Frequent in Princess Anne County: shallow water, south end of Fresh Pond, *L. F. & F. R. Randolph*, no. 483; ditch near Sigma, *F. G. & L.*, no. 4680; border of brackish marsh, Cedar Island, *F. G. & L.*, no. 4681.

Not listed by Kearney nor by Erlanson.

Eryngium aquaticum L. To the few recorded stations add Princess Anne County: fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4967.

Lilaeopsis chinensis (L.) Kuntze. To the few recorded Virginia stations add Princess Anne County: muddy banks and open spots

Photo. E. C. Ogden.

Ammannia Koehnei: figs. 1 and 2, type, × ½; fig. 3, upper leaf-bases, × 2.
A. Koehnei, var. exauriculata: fig. 4, plant from type-collection, × ½; fig. 5, upper leaf-bases, × 2.

Photo. E. C. Ogden.

VERBENA URTICIFOLIA: FIG. 1, fruiting inflorescence, × 1; FIG. 2, lower surface of leaf, × 10; FIG. 3, fruiting calyces, × 10; FIG. 4, ripe fruit, × 10.

V. URTICIFOLIA, var. LEIOCARPA: FIG. 5, portion of fruiting panicle, × 1; FIG. 6, lower surface of leaf, × 10; FIG. 7, fruiting calyces, × 10; FIG. 8, ripe fruit, × 10.

in swales along North Landing River, near Creed's, *F. L. & F.*, no. 4972. SURRY COUNTY: turfy tidal shore of James River, Claremont Wharf, *F. & L.*, no. 6847.

RHODODENDRON ATLANTICUM (Ashe) Rehder. Frequent in dry woods, oak scrub and pinelands, from PRINCESS ANNE to SUSSEX COUNTY: many nos.

Not noted by Kearney nor by Erlanson.

R. NUDIFLORUM (L.) Torr. Swampy woods, common in PRINCESS ANNE and NORTHAMPTON COUNTIES: many nos.

Not noted by Kearney.

GALAX APHYLLA L. PRINCESS ANNE COUNTY: rich woods east of Little Creek, *F. & G.*, no. 4490, *F. L. & F.*, no. 4985. ISLE OF WIGHT COUNTY: rich wooded bank of Blackwater River, near Joyner's Bridge, *F. G. & L.*, no. 6668.

Not mentioned by Kearney.

LIMONIUM NASHII Small, var. TRICHOGONUM Blake. NORTHAMPTON COUNTY: border of salt marsh east of Eastville, *F. & L.*, no. 5409.

L. CAROLINIANUM (Walt.) Britton, var. ANGUSTATUM (Gray) Blake. PRINCESS ANNE COUNTY: salt marsh, arm of Lynnhaven Bay, at Third Street Bridge, Great Neck, *F. & L.*, no. 4986.

Not listed by Kearney.

*HOTTONIA INFLATA L. PRINCESS ANNE COUNTY: pool in gum swamp, west of Pungo, *F. & G.*, no. 4491.

First specimen in the Gray Herbarium from between southern New Jersey and Georgia.

BUMELIA LYCIOIDES (L.) Gaertn. f., var. **virginiana**, var. nov., foliis ramorum fertilium oblanceolatis, 1.3–2.8 cm. latis, apicibus valde rotundatis.—VIRGINIA: edge of tidal marsh, Carter's Creek, York River, August 20, 1921, *E. J. Grimes*, no. 4269; Sewell's Point, Norfolk County, June 28, 1872, *A. H. Curtiss;* dry wooded slope near 3d Street Bridge, Great Neck, Princess Anne County, May 5, 1935, *Fernald & Griscom,* no. 4492 (young foliage), June 17, 1935, *Fernald, Griscom & Long,* no. 4688 (young flower-buds), September 5, 1935, *Fernald & Long*, no. 4987 (fruit), TYPE in Gray Herb.; rich dry woods, Little Neck, Princess Anne County, September 6, 1935, *Fernald & Long,* no. 4988.

Bumelia lycioides rests, nomenclaturally, upon *Sideroxylon lycioides* L. Sp. Pl. ed. 2: 279 (1762), said to grow in "Canada." Linnaeus cited references from Duhamel de Monceau and Boerhaave but his species must rest primarily on his own *Lycioides*, Hort. Cliff. 488. In Hortus Cliffortianus Linnaeus stated that the tree came from the East Indies or perhaps from Africa ("Crescit vel in India Orientali?

vel potius in Africa?"). It is now generally recognized as the characteristic Carolina Buckthorn of the southern United States.

The tree usually passing as *Bumelia lycioides* has the mature leaves of the fruiting branches (excluding those of the sprouts and leading shoots) elliptic-oblong to narrowly obovate, tapering to a blunt but subacuminate apex, and becoming 2–3.8 cm. broad. This tree, occurring from Florida to Texas, extends north into North Carolina, western Kentucky, southern Illinois, southern Missouri and Kansas. The tree of southeastern Virginia always, so far as known (from four areas), has the leaves of the fertile branches strongly rounded at apex and when mature only 1.3–2.8 cm. broad, and so far as we yet know this tree with narrower and round-tipped leaves occurs only at this northeastern limit of the specific range.

In view of the original obscurity as to the geographic source of *Lycioides*, I asked Mr. C. A. Weatherby to determine, while in England in the summer of 1935, just what Linnaeus had before him. He reports that there is no Clifford specimen at the British Museum, but that in the Linnean Herbarium the material marked in the hand of Linnaeus "*lycioides*" is of the characteristic southern tree with the narrowly obovate leaves abruptly narrowed to a blunt apex; a photograph secured by Mr. Weatherby confirms this identification. Incidentally, Mr. Weatherby determined that *Sideroxylon laeve* Walt. Fl. Carol. 100, is also the more southern tree with subacuminate leaves. In this connection it is at least noteworthy that Sargent, in the Silva, should have described the leaves as "acute and rounded at apex" but that Faxon's plate[1] should have shown the flowering branch of var. *virginiana*, with the leaves unquestionably round-tipped. This drawing was obviously made from the Curtiss material from Norfolk County.

Whether or not the specific name "*lycioides*" should be written with a capital or a small initial is debatable. By the International Rules, Recommendation no. XLII, the specific epithet takes a capital initial when taken from a generic name. The question is whether *Lycioides* of Linnaeus, Hortus Cliffortianus, *was* a generic name. At the end of his Class XXV in the latter work, Linnaeus, after properly treating unquestioned genera, such as *Cycas*, *Trapa*, *Conocarpus*, *Liquidambar*, *Zanthoxylum*, etc., had a nondescript category "Oidea," for plants of which he did not have the necessary flowers to place them in the

[1] Sargent, Silva, v. t. ccxlviii.

regular genera. He treated these as *hypothetical* genera, giving them provisional names indicating their similarity to recognized genera: *Oleoides, Cannoides, Lycioides,* etc., the last "*Facies perfecte Lycii, tristis,*" etc. If *Lycioides* be considered a generic name, then the specific name repeating it should be given a capital initial. The fact, that in publishing *Sideroxylon lycioides* Linnaeus used a small initial, has only a minor bearing on the question, for in some other cases Linnaeus used lower-case initials for old generic names used as specific epithets. I am keeping, however, to the long established usage. It might be thought by some that Linnaeus, whose names and often quite inconsistent and frequently unidentifiable species are usually overglorified, was violating the provisions of the 1935 rules in publishing hypothetical or provisional genera. I leave the decision on that point to those who are better able to solve such problems.

FRAXINUS PENSYLVANICA Marsh. NORFOLK COUNTY: gum swamps and wet woods near Indian Creek, *F. G. & L.*, no. 4690. Thence westward to the Fall Line.

Not listed by Kearney.

GENTIANA PARVIFOLIA (Chapm.) Britton. NORTHAMPTON COUNTY: wet pine woods, Eastville, *F. & L.*, nos. 4714, 4717; by brook in swampy woods south of Kendall Grove, *F. L. & F.*, no. 4515. ACCOMAC COUNTY: border of low woods, 2 miles south of Painter, *F. L. & F.*, no. 5416; border of low woods, 1½ miles north of Temperanceville, *F. L. & F.*, no. 5418. Westward to ISLE OF WIGHT and western NANSEMOND COUNTIES.

Extensions north and west from Princess Anne County.

G. VILLOSA L. PRINCESS ANNE COUNTY: rich dry woods, Great Neck, *F. & L.*, no. 4993; rich woods, Virginia Beach, *F. L. & F.*, no. 4994. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, nos. 4995, 4997.

Not listed by Kearney.

IPOMOEA LACUNOSA L. PRINCESS ANNE COUNTY: grassy roadside, Pleasant Ridge, *F. L. & F.*, no. 5008; roadside-banks and fence-rows near Creed's, *F. L. & F.*, no. 5009.

Not listed by Kearney nor by Erlanson.

PHLOX PANICULATA L. PRINCESS ANNE COUNTY: roadside-banks and fence-rows near Creed's, *F. L. & F.*, no. 5012.

Not listed by Kearney nor by Erlanson.

*VERBENA URTICIFOLIA L., var. **leiocarpa** Perry & Fernald, var. nov. (TAB. 450, FIGS. 5–8), foliis subtus minute velutino-hirtellis, pilis longioribus vix 0.3 mm. longis; ramis floriferis filiformibus laxe

adscendentibus vel divergentibus puberulis; bracteis 0.5–1 mm. longis; calycibus maturis 1.7–2 mm. longis puberulis; coccis 1.5 mm. longis lucidis dorso planis.—Eastern Virginia to South Carolina, rarely northward to Connecticut. CONNECTICUT: damp woods, Wethersfield, *Charles Wright.* NEW JERSEY: sandy loam by Maurice River, Port Elizabeth, November 8, 1936, *Long.* VIRGINIA: rich woods, Virginia Beach, September 10, 1935, *Fernald, Long & Fogg,* no. 5013 (TYPE in Gray Herb.); rich sandy and loamy wooded slope north of Walters, August 20 and 22, 1936, *Fernald, Griscom & Long,* no. 6674; border of dry sandy woods, 4 miles south of Stony Creek, August 19, 1936, *Fernald, Griscom & Long,* no. 6673; rich woods southeast of Ivor, October 16, 1936, *Fernald & Long,* no. 6864. NORTH CAROLINA: moist ground, Durham Co., August 26, 1932, *H. L. Blomquist,* no. 149. SOUTH CAROLINA: damp gum-oak woods, 1 mile north of Kingstree, Williamsburg Co., July 11, 1927, *Wiegand & Manning,* no. 2714.

Common and wide-ranging typical *Verbena urticifolia* has the leaves strigose-hirsute on the veins beneath (FIG. 2) with stiff hairs up to 1–1.3 mm. long, or glabrate; the mature inflorescence (FIG. 1) with usually stiffly ascending strigose branches; mature calyx (FIG. 3) strigose, 2–2.3 mm. long, the subtending bract 1–1.5 mm. long; mature nutlets (FIG. 4) about 2 mm. long and definitely corrugated or ribbed on the back. Var. *leiocarpa,* on the other hand, has the thin leaves (FIG. 6) velutinous or subvelutinous beneath with minute hairs only very rarely 0.3 mm. long; the panicle (FIG. 5) lax, with loosely ascending to divergent puberulent, filiform mature branches; the mature calyx (FIG. 7) at most 2 mm. long and puberulent, with very short (0.5–1 mm. long) bract; and the tiny nutlets (FIG. 8) only 1.5 mm. long and quite smooth on the back. Although an old and undated sheet from Connecticut is in the Gray Herbarium, no other material is found there or in the extensive local collection of the New England Botanical Club from north of New Jersey.

Verbena urticifolia, var. *leiocarpa,* although having the same general lax habit as *V. SCABRA Vahl, collected by *Fernald & Long* in SURRY COUNTY, October, 1936 (border of tidal marsh along Gray's Creek, near Cross Creek Landing, south of Swann Point, no. 6863, the first collection from north of Wilmington, North Carolina), may be readily distinguished in flower by the bilobed character of the stigma, the stigmatic surface being subtended by one sterile lobe. In *V. scabra,* on the other hand, the stigmatic surface lies between two almost equal sterile lobes. The fruiting calyx of *V. urticifolia,* var. *leiocarpa* is only slightly divergent from the rachis and the nutlets are smooth; whereas, in *V. scabra* the fruiting calyx is strongly divergent and the

nutlets reticulate above. Furthermore, after drying, the plants in question are easily separable on foliar character, the upper surface of the leaves of *V. urticifolia*, var. *leiocarpa* being much less harsh to the touch than those of *V. scabra*.

V. CANADENSIS (L.) Britton. PRINCESS ANNE COUNTY: roadside bank, Creed's, *F. & G.*, no. 4496.

In Dr. Perry's *Revision of the North American Species of Verbena* (Ann. Mo. Bot. Gard. xx. 316 (1933)) recorded northward only to North Carolina but Small (Man.) extends the range to Virginia.

STACHYS HYSSOPIFOLIA Michx. YORK COUNTY: exsiccated clay-bottomed pond in woods, 2 miles south of Yorktown, *F. L. & F.*, no. 5016.

Not listed by Erlanson. According to Epling, Prelim. Revis. Am. Stachys in Fedde, Repert. Sp. Nov. Reg. Veg. Beih. lxxx. 71 (1934) the species "ranges from Eastern Massachusetts along the coast to New Jersey and Delaware, thence inland to eastern Pennsylvania. It occurs also in the Appalachian system in northern Virginia and in western North Carolina." Our station is, therefore, the first on the Coastal Plain south of Delaware.

S. TENUIFOLIA Willd. PRINCESS ANNE COUNTY: wet argillaceous thickets and ditches, Rosemont, *F. & L.*, no. 5017.

Not listed by Kearney nor by Erlanson.

HEDEOMA PULEGIOIDES (L.) Pers. NORTHAMPTON COUNTY: dry clearing bordering pine woods, south of Kendall Grove, *F. L. & F.*, no. 5435.

Not listed by Kearney nor by Erlanson.

*LINARIA CANADENSIS (L.) Dumont, forma **cleistogama**, f. nov., corollis minutis tubulosis vel subconicis e calyce vix exsertis clausis. —VIRGINIA: sandy pineland, Cape Henry, May 4, 1935, *Fernald & Griscom*, no. 4498 (TYPE in Gray Herb.; ISOTYPES in Herbs. Griscom and Phil. Acad.); sandy woods and openings, False Cape, June 20, 1935, *Fernald, Griscom & Long*, no. 4698.

Late in the season the flowers of *Linaria canadensis* may become greatly reduced in size, though morphologically normal. Forma *cleistogama* at Cape Henry and at False Cape was abundant in the dry sand, the vernal flowers quite insignificant and completely closed, forming a blunt cap above the ovary.

GERARDIA DECEMLOBA Greene. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5034.

Not listed by Kearney. The easternmost Virginia station given by

Pennell, Proc. Acad. Nat. Sci. Phila. lxxxi. 208 (1929), is New Bohemia in Prince George County. Kilby is 50 miles southeast of New Bohemia, well out on the Coastal Plain.

*Utricularia virgatula Barnhart. Northampton County: moist dune-hollows, Savage Neck, *F. L. & F.*, no. 5450.

An important discovery, giving us a station intermediate between Cape May, New Jersey and Florida and Cuba. When he published the species in Bull. Torr. Bot. Cl. xxxiv. 580 (1907) Barnhart had seen material only from Long Island, from Cape May and from Florida and Cuba, the "resemblance [of the latter to the Long Island and Cape May material] is indeed so close that I am unable to name any character by which they may be distinguished. . . it seems better to refer the material from Cuba and Florida provisionally to *U. virgatula.*" On Savage Neck several other species, far isolated from their allies occur: *Cyperus Engelmanni* at its first station south of New York (see p. 395), *Carex arenaria* of Atlantic Europe (see p. 399), *Wolffia punctata* at its first coastwise station north of Florida (see p. 400) and *Cassia nictitans* var. *hebecarpa*, otherwise known only in North Carolina (see p. 423).

Epifagus virginiana (L.) Bart. Princess Anne County: under *Fagus*, dry woods west of Pungo, *F. & G.*, no. 5037.

Not listed by Kearney.

Houstonia purpurea L., forma **pubescens** (Britton), comb. nov. *H. purpurea*, var. *pubescens* Britton, Mem. Torr. Bot. Cl. iv. 125 (1894).—Our material is from Northampton County: dry pine woods east of Eastville, *F. & L.*, no. 5470.

Forma *pubescens* at Eastville and at a number of other stations occurs with or near to typical smoother *Houstonia purpurea.* It seems to be a pubescent form, rather than a geographically isolated variety.

*Cephalanthus occidentalis L., var. pubescens Raf. Princess Anne County: wet argillaceous thickets, Rosemont, *F. & L.*, no. 5047. Elizabeth City County: marshy borders of woods between Buckroe and Hampton, *B. L. Robinson*, no. 445.

First in the Gray Herbarium from north of Georgia.

Galium uniflorum Michx. Recorded from Princess Anne County, new to Virginia, in Rhodora, xxxvii. 446 (1935). Range now extended northward and westward. Northampton County: sandy woods back of dunes, Savage Neck, *F. & L.*, no. 5457; dry pine woods south of Kendall Grove, *F. L. & F.*, no. 5458. Isle of Wight

County: rich sandy and loamy wooded slope north of Walters, *F. G. & L.*, no. 6697.

Ripe fruit purple-black, succulent.

Viburnum prunifolium L. Prince George County: border of rich dry woods, Great Neck, *F. G. & L.*, no. 4705. Norfolk County: damp thicket, Cedar Hill, *F. & G.*, no. 4508. Thence west to the Fall Line.

Not recorded by Kearney from east of Nansemond County.

Lobelia elongata Small. To the type-locality, Northwest in Norfolk County, cited by McVaugh in Rhodora, xxxviii, 286, add Princess Anne County: brackish marsh by North Landing River, Pungo Ferry, *F. & G.*, nos. 2946, 2947, also at same station (near Creed's),[1] *F. L. & F.*, no. 5053.

Elephantopus carolinianus Willd. Princess Anne County: rich woods, Virginia Beach, *F. & G.*, no. 2896, *F. L. & F.*, no. 5058. Nansemond County; dry sandy woods along Pitch Kettle Creek, north of Lake Kilby, *F. L. & F.*, no. 5059. Thence west to the Fall Line.

Not listed by Kearney.

E. tomentosus L. Princess Anne County: rich woods, Virginia Beach, *F. L. & F.*, no. 5056. Thence westward to the Fall Line. Northampton County: in *Pinus Taeda* forests about Cape Charles, *Tidestrom*, no. 11,595; dry sandy pine woods, Eastville, *F. & L.*, no. 5480.

Not listed by Kearney. The species is not recorded for Maryland by Shreve. We found it in some abundance, when, returning by car to Philadelphia, we stopped at twilight to collect *Nyssa sylvatica*, var. *biflora* (Walt.) Sarg., near its northern limit. At the base of a tree covered with *Bignonia capreolata*, also near its northern limit, *Elephantopus tomentosus* was abundant: border of gum swamp, south of Beaver Dam, along Wagram Creek, Worcester County, Maryland, *F. L. & F.*, no. 5574.

Elephantopus tomentosus L., forma **rotundatus**, forma nov., foliis rotundato-obovatis vel rotundato-ovalibus.—Virginia: dry

[1] Although appearing on the contour-sheet as Pungo Ferry, this region supports no ferry. Visiting it in 1935, Long, Fogg, and I wished to secure a boat. The locked boat on the river evidently pertained to the nearest house. Accordingly, untying the gate, I walked across the field to the door. Upon knocking, I was seized by my right calf by a yapping dog. As soon as the women folks had dragged her off and administered the necessary slaps my errand was transacted. If I wanted a boat "Bub" must be asked. "Bub," six feet tall and asleep at high-noon with his bare feet overhanging a bed in the kitchen, awoke and said: "Ask Paw." "Paw," roused from another bed, agreed, for sufficient pay, to let us take the boat. The compensation and a gift of grapes for all the family sweetened the atmosphere: "De nex time you alls want de boat dat bitch'll know enough to let you alone."

clearing bordering pine woods south of Kendall Grove, Northampton Co., October 13 and 15, 1935, *Fernald, Long & Fogg*, no. 5482 (TYPE in Gray Herb.).

Typical *Elephantopus tomentosus* has the narrowly to broadly obovate rosette-leaves tapering at base and once-and-a-half to thrice as long as broad, and its cauline bracteal leaves narrow and small. Forma *rotundatus*, with its round-based and round-tipped short rosette-leaves and broad and numerous cauline ones is a striking departure from it. This extreme variation may have resulted from clearing of the land but all the plants in a clearing of many acres were essentially uniform. A similar specimen in the Gray Herbarium, without rosette-leaves, but with the lower cauline one strongly rounded at both ends or even subcordate, was sent from Mississippi by Dr. Crockett (through C. W. Short, who commented on the "odd leaf").

SOLIDAGO PUBERULA Nutt., var. PULVERULENTA (Nutt.) Chapm. Noted in RHODORA, xxxvii. 447 (1935) from PRINCESS ANNE COUNTY. Range extended to ELIZABETH CITY COUNTY: bushy clearings and borders of woods west of Hampton, *F. L. & F.*, no. 5083.

S. PINETORUM Small. Recorded in RHODORA, l. c. 448 from PRINCESS ANNE, HENRICO and PITTSYLVANIA COUNTIES. Range extended slightly north to YORK COUNTY: border of dry woods, 2 miles south of Yorktown, *F. L. & F.*, no. 5086. Common inland to the Fall Line.

S. YADKINENSIS (Porter) Small. See Fernald, RHODORA, xxxviii. 211 (1936). NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5084; Suffolk, July 24, 1872, *A. H. Curtiss*, as *S. Boottii*, also *Heller*, no. 1127, as *S. Boottii*. Frequent westward to the Fall Line and beyond.

Flowering chiefly in late June and July.

S. LUDOVICIANA (Gray) Small. See Fernald, l. c. 200, pl. 422, figs. 2–5 (1936). NORTHAMPTON COUNTY: dry pine woods northwest of Oyster, *F. L. & F.*, no. 5512. JAMES CITY COUNTY: old grown-up field, south of Williamsburg, *Grimes*, no. 4445, as *S. Boottii*. PRINCE GEORGE COUNTY: dry sandy woods and clearings west of New Bohemia, *F. L. & S.*, no. 5932; dry woods, Blackwater School, *F. L. & S.*, no. 5933.

Very late-flowering, in late September and October.

S. NEMORALIS Ait., var. HALEANA Fernald, l. c. 227, pl. 431, figs. 1 and 2 (1936). NORTHAMPTON COUNTY: dry pine woods near Capeville, *F. L. & F.*, no. 5526; *F. & L.*, nos. 5524 and 5525, from Eastville, are less characteristic.

S. TORTIFOLIA Ell. Recorded in RHODORA, xxxvii. 448 (1935) from PRINCESS ANNE COUNTY, where local. NORTHAMPTON COUNTY: common in dry pine woods, many nos., one plant on Savage Neck (*F. & L.*, no. 5517) being an evident hybrid with *S. odora*.

Photo. E. C. Ogden.

ASTER SPECTABILIS, var. SUFFULTUS, × ⅓.

Photo. E. C. Ogden.

Involucres of Aster, × 4: A. spectabilis, figs. 2 and 3; A. spectabilis, var. suffultus, fig. 1; A. Curtisii, fig. 4.

It is probable that the northeastern limit of range of *Solidago tortifolia* is in Northampton or Accomac County. It has been cited from Maryland on the basis of the confusing blanket-label of the late William M. Canby: "EASTERN SHORE OF MARYLAND AND VIRGINIA." Under this label Canby distributed abundant material. Very similar specimens in the Gray Herbarium bear the memorandum in the hand of Asa Gray: "Northampton Co., Virginia. E. Shore, 1867. *W. M. Canby.*"

S. ELLIOTTII T. & G., var. PEDICELLATA Fernald in RHODORA, xxxviii. 215, pl. 425 (1936). The TYPE is from NORTHAMPTON COUNTY: border of wet pine woods, Eastville, *F. & L.*, no. 5520. Immature specimens from near Hampton (*F. L. & F.*, no. 5091) apparently belong with it.

Very late, flowering in mid-October.

*ASTER SPECTABILIS Ait., var. **suffultus**, var. nov. (TAB. 451 et TAB. 452, FIG. 1), planta 6–9 dm. alta; pedunculis glanduloso-pilosis; involucris subcylindrico-campanulatis 1.4–1.6 cm. altis; bracteis ca. 8-seriatis valde squarrosis, apicibus exteriorum valde foliaceis ovatis margine glanduloso-ciliatis.—VIRGINIA: bushy clearings and borders of woods, west of Hampton, September 13, 1935, *Fernald, Long & Fogg*, no. 5096 (TYPE in Gray Herb.).

Typical *Aster spectabilis*, occurring from eastern Massachusetts to Delaware and Maryland and reappearing in the Carolina mountains, is usually 2.5–6 (rarely –8) dm. high; with campanulate or (when dry) campanulate-hemispheric involucres (PL. 452, FIGS. 2 and 3) 0.8–1.4 cm. high; the bracts in about 6 series, the outer with oblong or oblanceolate, herbaceous tips loosely ascending to slightly squarrose. Isolated southward, on the southern coast of North Carolina, var. *cinerascens* Blake in RHODORA, xxx. 226 (1928), differs from typical *A. spectabilis* in its cinereous-hirsute and less glandular indument, but the involucres are otherwise much as in the more northern typical *A. spectabilis*. Var. *suffultus*, also isolated from the continuous range of *A. spectabilis*, has an involucre almost as suggestive of *A. Curtisii* T. & G. (PL. 452, FIG. 4) as of *A. spectabilis*, but *A. Curtisii* is a thin- and glabrous-leaved plant, with glandless and glabrous, broad involucres. *A. spectabilis*, var. *suffultus* has the glandular peduncles and involucres and the characteristic scabrous foliage of *A. spectabilis*.

Torrey & Gray, Fl. ii. 108 (1841), extended the range of *A. spectabilis* south to Florida. This is extremely doubtful. The Torrey & Gray material in the Gray Herbarium which was reputed to come from Florida was labeled in Gray's hand "Florida? *Croom*" and "β.", which

means that it was *A. spectabilis*, β. T. & G., l. c. with "flowering branches, or peduncles, few and slender, mostly simple, pilose with slender hairs as well as glandular-pubescent." This plant, type of *A. spectabilis*, β., is Blake's var. *cinerascens;* and it is significant that above his original "Florida? *Croom*" Gray later wrote in pencil "Perhaps N. Car." That is more probable.

Another old sheet in the Gray Herbarium, identified by Gray as *A. surculosus*, is marked "Herb. Raf. [inesque], 1842. Locality unrecorded." This consists of a plant of *A. spectabilis*, var. *cinerascens* and a characteristic top of the newly proposed var. *suffultus*. It is possible that Rafinesque had, presumably buried under some other genus, names for both these plants.

Aster gracilis Nutt. Princess Anne County: argillaceous clearings and borders of woods, Virginia Beach, *F. & L.*, no. 5097. Nansemond County: about Suffolk, *Heller*, no. 1140; dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5098. Thence west to the Fall Line.

Not recorded by Kearney from Virginia.

A. grandiflorus L. Nansemond County: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5099. Thence west to the Fall Line and northward at least to Hanover County: October 10, 1890, *T. C. Porter*.

An October-flowering species, very handsome. Not noted by Kearney.

A. concolor L. Northampton County: sandy and argillaceous bluff and upper border of beach, Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5531. Nansemond County: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5100. Thence west to the Fall Line.

Not recorded by Kearney nor by Erlanson.

*Aster concolor L., forma **lasiocaulis**, f. nov., caulibus villosis, villis patentibus; foliis plus minusve villosis.—Virginia: dry sandy and argillaceous pine woods back of the shore-bluff, west of Kiptopeke, October 14, 1935, *Fernald, Long & Fogg*, no. 5532 (type in Gray Herb.; isotypes in Herbs. Phil. Acad. and Univ. Penn.).

Typical *Aster concolor* (no. 5531), with minute canescent-puberulent or -sericeous coat, abounds on the steep outer bluff along Chesapeake Bay, west of Kiptopeke, and there shows no departure from the ordinary form. Forma *lasiocaulis* makes a pure colony back from the bluff, in woodland humus, where, at some seasons, the ground must be positively wet. The extreme development of pubescence may,

perhaps, be a response to these unusual conditions, typical *A. concolor* being a decided xerophyte.

A. PATENS Ait. NORTHAMPTON COUNTY: dry sandy and argillaceous pine woods back of the shore-bluff, west of Kiptopeke, *F. L. & F.*, no. 5533. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5101. Thence locally west to the Fall Line.

Not recorded by Kearney from southeastern Virginia.

ERIGERON PULCHELLUS Michx. PRINCESS ANNE COUNTY: rich woods, Great Neck, *F. & G.*, no. 4513.

Recorded by Kearney only from Suffolk.

E. PHILADELPHICUS L. PRINCESS ANNE COUNTY: rich woods, Cedar Island, *F. G. & L.*, no. 4707.

Not noted by Kearney.

*E. RAMOSUS (Walt.) BSP., var. BEYRICHII (Fisch. & Mey.) Trel. PRINCESS ANNE COUNTY: dry mixed woods, Little Neck, *F. & L.*, no. 4236. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5938. SOUTHAMPTON COUNTY: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6425.

Quite like the Beyrich material in the Gray Herbarium. Strikingly different from common *E. ramosus* in its very reduced foliage, small heads and often violet rays. It also flowers later. Not noted by Kearney nor by Erlanson.

*E. BONARIENSIS L. (*E. linifolius* Willd.) NORFOLK COUNTY: sandy roadside near Gertie, *F. G. & L.*, no. 4709.

Extension north from South Carolina.

SILPHIUM ATROPURPUREUM Retz. PRINCESS ANNE COUNTY: rich dry woods, Great Neck, *F. G. & L.*, no. 4711.

One of the rarest of species. Dr. L. M. Perry, who is studying the genus, tells me that she has seen only three sheets: one in the Alleghenies near White Sulphur, Greenbrier County, West Virginia; one from Wytheville, Wythe County, Virginia, between the Alleghenies and the Blue Ridge; and our collection from Princess Anne County.

HELIANTHUS ANGUSTIFOLIUS L. ELIZABETH CITY COUNTY: bushy clearings and borders of woods west of Hampton, *F. L. & F.*, no. 5144. Frequent from Nansemond County to the Fall Line.

Not listed by Erlanson.

BIDENS DISCOIDEA (T. & G.) Britton. NORTHAMPTON COUNTY: swampy woods near Martin's Siding, *F. L. & F.*, no. 5558. PRINCESS ANNE COUNTY: damp peaty depressions, Cape Henry, *F. & L.*, no. 5134. Frequent westward to the Fall Line, usually on fallen logs and stumps in swamps.

Not noted by either Kearney or Erlanson.

Senecio aureus L. Princess Anne County: rich woods, Great Neck, *F. & G.*, no. 4517.

Not listed by Kearney.

Krigia Dandelion (L.) Nutt. Princess Anne County: open clay, borders of thickets, Virginia Beach, *F. & G.*, no. 4518.

Not listed by Kearney nor by Erlanson.

Explanation of Plates 440–452

Plate 440. Spikelets of Leersia virginica Willd. Sufficiently explained on pp. 385 and 386.

Plate 441. Panicum dichotomiflorum Michx.: fig. 1, plant, × 2/5, from Clinton, Maryland, September 28, 1921, *Th. Holm.*

P. dichotomiflorum, var. geniculatum (Wood) Fernald: small plant, × 2/5, from Eastham, Massachusetts, September 24, 1913, *F. S. Collins.*

Plate 442. Panicum agrostoides Spreng.: fig. 1, portion of panicle, × 1, from near New York, *Gray, N. Am. Gram. Cyp.* no. 32; fig. 2, spikelets, × 10, from Bristol, Pennsylvania, August 5, 1922, *W. M. Benner;* fig. 3, grain, × 20, from Constantia, New York, *Fernald, Wiegand & Eames*, no. 14,147.

P. agrostoides, var. ramosius (Mohr) Fernald: fig. 4, portion of panicle, × 1, from Fontaine Creek, Virginia, *Fernald, Griscom & Long*, no. 6473; fig. 5, spikelets, × 10, from no. 6473; fig. 6, grain, × 20, from Factory Hill, Virginia, *Fernald & Long*, no. 6475.

P. stipitatum Nash: fig. 7, portion of panicle, × 1, from Centreville, Delaware, August 18, 1866, *Commons;* fig. 8, spikelets, × 10, from same specimen; fig. 9, grain, × 20, from same specimen.

Plate 443. Panicum mundum, n. sp.: fig. 1, portion of plant in autumnal state, × 2/5, from 4 miles northwest of Homeville, Virginia, *Fernald & Long*, no. 6499 (type); fig. 2, terminal vernal panicle, × 1, from type-station, *Fernald & Long*, no. 6017; fig. 3, summit of lower internode, bearded node and base of sheath, × 10, from type; fig. 4, sheath of upper leaf, showing viscid spots, × 10, from type; fig. 5, three spikelets, × 10, from type.

P. cryptanthum Ashe: fig. 6, spikelet, × 10, from Wilmington, North Carolina, August 28, 1905, *A. S. Hitchcock.*

P. aculeatum Hitchc. & Chase: fig. 7, spikelet, × 10, from Takoma Park, District of Columbia, July 27, 1904, *Agnes Chase* (isotype).

Plate 444. Scleria triglomerata Michx.: fig. 1, inflorescence and characteristic short-tipped bracts, × 1, from south of The Crater, Prince George County, Virginia, *Fernald, Long & Smart*, no. 5662; fig. 2, summit of inner side of sheath, × 10, from South Sudbury, Massachusetts, August 8, 1899, *W. P. Rich;* fig. 3, rhizome and bases of culms, × 1, from Buckroe, Virginia, *B. L. Robinson*, no. 336; fig. 4, achenes, × 5, from same plant as fig. 2.

S. minor (Britton) W. Stone: fig. 5, inflorescence, with characteristically tapering bracts, × 1, from head of Poo Run, Prince George County, Virginia, *Fernald, Long & Smart*, no. 5665; fig. 6, summit of inner side of sheath, × 10, from no. 5665; fig. 7, rhizome and bases of culms, × 1, from no. 5665; fig. 8, achenes, × 5, from no. 5665.

S. nitida Willd.: fig. 9, inflorescence, with characteristically tapering bracts, × 1, from south of Zuni, Virginia, *Fernald, Griscom & Long*, no. 6549; fig. 10, summit of inner side of sheath, × 10, from no. 6549; fig. 11, characteristic rhizome, × 1, from no. 6549; fig. 12, achenes, × 5, from no. 6549.

Plate 445. Juncus Griscomi, n. sp.: fig. 1, portion of plant, × 2/5, from Little Neck, Virginia, *Fernald, Griscom & Long*, no. 4604 (type); fig. 2, por-

tion of inflorescence, × 2, from the TYPE; FIG. 3, fruit, × 6, from the TYPE; FIG. 4, seeds, × 20, from the TYPE.

J. EFFUSUS L., var. COSTULATUS Fernald: FIG. 5, fruits, × 6, from the TYPE, Clement Pond, Barrington, Nova Scotia, *Fernald, Long & Linder*, no. 20,654.

J. GYMNOCARPUS Coville: FIG. 6, capsule, × 6, from an ISOTYPE, Broad Mountain, Schuylkill County, Pennsylvania, August 24, 1866, *C. E. Smith.*

PLATE 446. MALAXIS BAYARDI, n. sp.: FIG. 1, four plants, × 1, from Kilby, Virginia, *Fernald, Long & Fogg*, no. 4851 (TYPE); FIG. 2, portion of raceme, × 10, from the TYPE.

M. UNIFOLIA Michx.: FIG. 3, raceme, × 1, from Cuthbert, Georgia, *Harper*, no. 1892.

PLATE 447. VARIETIES OF PARONYCHIA FASTIGIATA (Raf.) Fernald, all figs. × 10. P. FASTIGIATA, var. TYPICA: FIG. 2, fruits from Clark County, Indiana, *Deam*, no. 7585; FIG. 3, fruits from Burlington, Massachusetts, August 26, 1900, *E. F. Williams;* FIG. 4, flowers and fruit from Waterford, New York, *House*, no. 13,354; FIG. 5, flowers and fruit from Clark County, Indiana, *Deam*, no. 7540.

Var. PALEACEA, n. var.: FIG. 6, flowers from Mt. Cuba, Delaware, July 30, 1878, *Commons* (TYPE); FIG. 7, flowers from Allegheny Mts., *Steele & Steele*, no. 26.

Var. NUTTALLI (Small) Fernald: FIG. 8, fruits from Blue Ridge Summit, Pennsylvania (type-locality), 1886, *Tatnall.*

Var. PUMILA (Wood) Fern.: FIG. 9, fruit from Allegheny Mts., *Steele & Steele*, no. 3; FIG. 10, flowers and fruits from Kate's Mt., Greenbrier County, West Virginia, September 4, 1920, *Marion S. Franklin;* FIG. 11, fruits from Three-Top Mt., Shenandoah County, Virginia, *Hunnewell & Griscom*, no. 15,169.

P. CANADENSIS (L.) Wood: FIG. 1, fruit from Danvers, Massachusetts, August 14, 1887, *J. H. Sears.*

PLATE 448. CASSIA NICTITANS L.: FIG. 4, surface of legume, × 4, from Cape Henry, Virginia, *Fernald & Griscom*, no. 2830.

C. NICTITANS L., var. HEBECARPA, n. var.: FIG. 1, plant, × 1, from TYPE-COLLECTION, Old Town Neck, Northampton County, Virginia, *Fernald, Long & Fogg*, no. 5316; FIG. 2, leaf, × 4, from the TYPE; FIG. 3, surface of legume, × 4, from the TYPE.

C. NICTITANS L., var. LEIOCARPA, n. var.: FIG. 5, surface of legume, × 4, from the TYPE, Pine Mountain, Bell County, Kentucky, *Kearney*, no. 496.

PLATE 449. AMMANNIA KOEHNEI Britton: FIGS. 1 and 2, plants, × ½, from Hackensack Meadow, New Jersey, *Torrey* (TYPE in Herb. N. Y. Bot. Gard.); FIG. 3, bases of upper leaves with axillary flowers (one petal showing), × 2, from Jacksonville, Florida, *A. H. Curtiss*, no. 5133.

A. KOEHNEI, var. EXAURICULATA, n. var.: FIG. 4, small plant, × ½, from North Landing River, Virginia, *Fernald, Long & Fogg*, no. 4954 (TYPE); FIG. 5, bases of upper leaves and axillary flowers, × 2, from the TYPE.

PLATE 450. VERBENA URTICIFOLIA L.: FIG. 1, portion of characteristic fruiting inflorescence, × 1, from West Cambridge, Massachusetts, September 29, 1894, *B. L. Robinson;* FIG. 2, lower surface of leaf, × 10, from Lancaster, Pennsylvania, August 29, 1900, *Heller;* FIG. 3, fruiting calyces, showing the bracts, × 10, from Dedham, Massachusetts, August 22, 1897, *E. F. Williams;* FIG. 4, ripe fruit, × 10, from Belmont, Massachusetts, September 27, 1891, *Walter Deane.*

V. URTICIFOLIA, var. LEIOCARPA Perry & Fernald, n. var.: FIG. 5, portion of fruiting inflorescence, × 1, from Virginia Beach, Virginia, *Fernald, Long & Fogg*, no. 5013 (TYPE); FIG. 6, lower surface of leaf, × 10, from the TYPE; FIG. 7, fruiting calyces and bracts, × 10, from the TYPE; FIG, 8, ripe fruit, × 10, from the TYPE.

PLATE 451. ASTER SPECTABILIS Ait., var. SUFFULTUS, n. var. TYPE SPECIMEN, × ⅓, from Hampton, Virginia, *Fernald, Long & Fogg*, no. 5096.

PLATE 452. Involucres of ASTER, × 4. FIG. 1, A. SPECTABILIS Ait., var.

suffultus, n. var., from type specimen. Fig. 2, A. spectabilis Ait., from Orleans, Massachusetts, *Fernald*, no. 694; fig. 3, A. spectabilis from Brookline, Massachusetts, September 12, 1889, *Faxon*. Fig. 4, A. Curtisii Torr. & Gray, from Haywood County, North Carolina, September, 1897, *E. E. Magee*.

SOME NOTEWORTHY PLANTS OF YORK COUNTY, MAINE[1]

Anne E. Perkins

My field excursions during the summer of 1935 resulted in the collection of several species believed to be new to the flora of Maine, and observations on a number of others which are rare or otherwise noteworthy.

Specimens of some of these have been given to the herbarium of the Portland Society of Natural History, some to the Gray Herbarium, and all to the herbarium of Cornell University. Specimens sent to the Gray Herbarium, have been verified by Dr. M. L. Fernald, and all sent to Cornell have been verified by Mr. S. H. Burnham.

Chamaecyparis thyoides (L.) BSP. The status of this plant in Maine for many years rested upon the published report of its occurrence at Kittery and York, by Dr. Goodale 1869, Proceedings Portland Society of Natural History, I (ii) 129, no herbarium specimens being known. August 10, 1916, four members of the Josselyn Botanical Society, Dr. M. L. Fernald, Mr. Bayard Long, Mr. Edward B. Chamberlain and Arthur H. Norton, with careful directions furnished by Mr. Winfield E. Hanson of Kennebunkport, "visited the remains of a once large stand"[2] of the tree in Lyman, and secured good specimens. During the summer of 1935 I visited another sizable stand in Sanford, and again secured good specimens.

Echinodorus tenellus (Martius) Buchenau. I collected this species July 18, 1935 at the estuary of Salmon Falls River, South Berwick. The specimens were sent to the herbarium of Cornell University. It is new to the flora of Maine, its nearest known approach being eastern Massachusetts. Though a plant with a wide range, it has been characterized by Dr. Fernald as one of "dramatic isolation" in respect to its known stations.

Scirpus lineatus Michaux. This species, also new to Maine, I collected at Tatnic, South Berwick, August 5, 1935. Specimens were sent to Cornell, and verified by Mr. S. H. Burnham.

Lemna minor Linn. Bauneg Beg Pond, North Berwick. Though

[1] My previous paper, "Notes on Some Rare Plants of York County, Maine" in Rhodora, 37: 415–416, 1935, enumerates nineteen species.

[2] 1920, Bull. Josselyn Bot. Soc. No. 6, 7.

frequent in southwestern Maine, few if any stations have been recorded in print.

Xyris montana Ries. Common on treacherous peat beds in a boggy arm of Sand Pond, Sanford, August, 1935.

Xyris Smalliana Nash. Common with the last on the slightly emersed oozy peat beds adjacent to Sand Pond, Sanford in August, 1935. This is new to Maine. Specimens are now in all the herbaria named above, and the herbarium of the University of Pennsylvania.

Samolus floribundus HBK. Common on the estuary, Salmon Falls River at South Berwick.

Bartonia virginica (L.) BSP. Abundant and lusty near Hooper's Mills, South Berwick, August, 1935.

Chaenorrhinum minus (L.) Lange. Found along railroad tracks, North Berwick, September 6, 1935.

Penstemon pallidus Small. Abundant by a roadside in Eliot in June, 1935.

Utricularia purpurea Walt. This plant, which seems to be rare in Maine, I found in a small colony in Bauneg Beg Pond, North Berwick in August, 1935.

Aster subulatus Michx. This Aster I found to be quite common at the estuary of Salmon Falls River, South Berwick in August and September, 1935. Though this inconspicuous plant has been cited for the Maine flora at least since the first edition of Gray's Manual (1848, p. 205), and continually carried forward in the citations of its range, it seems that there is little if any material in collections to substantiate the record. I have furnished specimens to the several herbaria mentioned above.

Berwick, Maine.

NORTHEASTWARD EXTENSIONS IN THE MAINE FLORA

George B. Rossbach

Chamaecyparis thyoides (L.) BSP. was collected June 16, 1930, from a quaking sphagnum bog, Knights Bog, Northport, Waldo Co. Trees are stunted, and scattered or clumped over portions of the open bog. On August 17, 1931 the same tree was collected from a very wet, cold, wooded bog called Cedar Swamp, in Appleton, Knox Co. Here the frequent trees are vigorous, straight, evenly tapering, attaining a diameter at the base of from 4–10 inches. In both localities fruit is present.

Heretofore, C. thyoides was known to extend locally northeastward to Alfred, York Co., Maine (August 10, 1916, *Fernald & Long*, no. 12362), and to Lyman, York Co. (August 10, 1916, *Fernald & Long*, no. 12363 and August 11, 1916, R. C. Bean, no. 16974), and north to Bradford, Merrimack Co., New Hampshire (October 4, 1928, *Fernald & Svenson*, no. 730). Therefore, Waldo and Knox

Counties, Maine are much farther northeast than the previously known range.

Cyperus filicinus Vahl has been known along the coast locally to Sagadahoc Co., Maine, where it was collected at Phippsburg, August 23, 1909, by *M. L. Fernald,* no. 1379, and on September 14, 1907, by *K. Furbish,* and at Woolwich, September 15, 1916, by *Fernald & Long,* no. 12758. On August 29, 1931, specimens of this plant were collected from mud and gravel, brackish, tidal shore, Bald Hill Cove, Penobscot River, Winterport, Waldo Co.

Scirpus cyperinus (L.) Kunth. var. Andrewsii Fernald, with its elongate, cylindric, and not ovoid, spikelets, was taken from a swamp bordering Coleman Pond, Lincolnville, Waldo Co., on Spetember 11, 1931. Originally, this variety was supposed to be confined to areas in Connecticut, but it was found by *Prof. M. L. Fernald* at Glacialis, Cambridge, Massachusetts, and later represented as far northeast as Bowdoinham, Sagadahoc Co., Maine, September 14 and 19, 1916, *Fernald & Long,* no. 12870.

Carex platyphylla Carey, known from rich woods locally to York Co., Maine, and northern New Hampshire, is represented from farther north or east only very sparsely: Mt. Royal, Quebec, June, 1914, *Bro. Victorin,* no. 728; and, "Limestone ledges in woods," Phillipsburg, Missisquoi Co., Quebec, August 10–11, 1923, *C. H. Knowlton.* It is rather odd to find this plant growing on the deciduous-wooded, rocky and somewhat limy base of Mt. Megunticook, Camden, Knox Co., Maine, June 24, 1930.

Very near Carex platyphylla, but on the exposed, limy talus, was collected, on June 24, 1930, Geranium carolinianum L. var. confertiflorum Fernald, where it grows in company with Cardamine parviflora L., Arabis Drummondi Gray, Corydalis sempervirens (L.) Pers., and Geranium Robertianum L. Geranium carolinianum var. confertiflorum is represented from ledges at Presumpscot Gorge, Falmouth, Cumberland Co., Maine, July 11, 1907, *R. C. Bean,* no. 958, but as far as I can ascertain, the above station and mine, much farther east, in Knox Co., are the only two stations known beyond the local spots in Essex and Middlesex Counties, Massachusetts, and Carroll Co., New Hampshire, which border the general range northeastward.

Erigeron pulchellus Michx. was collected from an old orchard, Pitcher Pond, Lincolnville, Waldo Co., Maine, June 15, 1935. It is very rare and local in the region. At this locality is one patch, which is slowly becoming larger over the damp, grassy hillside. Not far from Lincolnville, "in dry open woods" of Rockport, Knox Co., *Prof. M. L. Fernald* collected it on August 13, 1913, no. 10614. The next station southwestward, Vassalboro, Kennebec Co., July 6, 1916, *M. L. Fernald,* no. 14749, is, again, widely isolated.—Cambridge, Massachusetts.

A MEMORIAL VOLUME TO CYRUS GUERNSEY PRINGLE.—Some of the older members of the New England Botanical Club may remember Dr. Pringle—one of the best collectors of all time, a man of uncompromising uprightness, an earnest devotee of science in his field. He is said to have phrased tersely the ultimate justification of all work in pure science. Once, the story goes, a farmer who had found him gathering an insignificant-looking weed, asked, with some contempt, what that was good for. "It's good" said Pringle, "to cure ignorance."

Those of us who did know him and his attitude toward his work will feel, I think, that he would have liked and would have chosen just such a plain, useful and straightforward memorial volume as that which the University of Vermont has lately issued. The book, compiled by Mrs. Helen Burns Davis, contains a brief biographical introduction; transcripts of all passages in Pringle's diaries relating to his botanical work in Mexico during the years 1885–1909; reprints of some of his own accounts of his journeys, originally published in "Garden and Forest"; two lists of all his Mexican collections, one systematic and one numerical, both giving determinations of his specimens and recording their presence or absence in the three herbaria which have his first sets—his own at the University of Vermont, the Gray and Farlow Herbaria at Harvard and the United States National Herbarium; and adequate indices. It is now possible to construct continuous and detailed itineraries of his journeys, to get various pieces of collateral information about his specimens—matter of much interest and often of importance to the taxonomist—and readily to locate any particular collection-number desired. And the diaries afford glimpses of Pringle's personality and of his methods of work which are also to be welcomed.

Mrs. Davis has done her work faithfully and to all appearances well—just how well, only use of the book can fully show. It would have been more accurate to specify the Farlow Herbarium as the place of deposit at Harvard of Pringle's lower cryptogams, instead of assigning everything to the Gray. And one could wish that his early journeys to the Pacific states in 1880–1884 and those to Cuba in his last active years might have been included. Perhaps the data in regard to them does not exist. In any case, Pringle's name will always be chiefly associated with the exploration of the Mexican flora in which he stands so high; and of that, we have the story here.[1]—C. A. W.

Volume 38, no. 455, including pages 373–408 and plates 439–446, was issued 7 November, 1936.

[1] Davis, Helen Burns. Life and Work of Cyrus Guernsey Pringle. Burlington. Vermont. 1936. 756 pp., 2 portr. Paper. For sale at the Pringle Herbarium. Williams Science Hall, University of Vermont, Burlington, Vermont; price $1.50.

ERRATA

Page 4, line 25; *for* exercized *read* exercised.
Page 7, line 29; *for* This group of plants *read* Plants of this group.
Page 8, line 13; *for* America *read* American.
Page 12, line 25; for *trichophullus* read *trichophyllus*.
Page 18, line 34; for *culare* read *cularis*.
Page 22, line 34; for *trichophyllon* read *trichophyllos*.
Page 24, line 8; for *circinnatus* read *circinatus*.
Page 24, line 34; for *trichophyllus* read *trichophyllos*.
Page 25, line 14; for *trichophyllus* read *trichophyllos*.
Page 32, line 32; *for* Cram's *read* Crane.
Page 35, line 13; for β. *tripartiti* read *B. tripartiti*.
Page 36, line 22; *for* hispidulo *read* hispidula.
Page 43, line 35; *for* Dare *read* Dane.
Page 47, line 38; *for* Crams *read* Crane.
Page 73, line 37; for *S. calycinus* read *S. calycina*.
Page 96, line 25; for *rima* read *rimum*.
Page 146, line 16; *for* (1928) *read* (1924).
Page 146, line 33; *for* COLLECTEANA *read* COLLECTANEA.
Page 179, line 18; for *glauca* read *glaucum*.
Page 189, line 41; for *Meibomia nudiflora foliolata* read *Meibomia nudiflora*, forma *foliolata*.
Page 305, Fig. 14, swing map one turn to the right.
Page 376, line 31; for *virginiana* read *virginica*.
Page 377, line 36; for *Xanthoxylum* read *Zanthoxylum*.
Page 381, line 6; for *scoparius* read *virginicus*.
Page 381, line 10; for *Xanthoxylum* read *Zanthoxylum*.
Page 381, line 30; *for* Point *read* Neck.
Page 398, line 18; *for* ovoid- *read* ovoid.
Page 407, line 20; for *Standfieldii* read *Stanfieldii*.

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